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**AN ANALYSIS OF TEACHER DISTRIBUTION ACROSS DISTRICTS AND
SCHOOLS IN THE DETROIT METROPOLITAN AREA**

by

CHRISTINA SUSANNE KRISPIEN

DISSERTATION

Submitted to the Graduate School

of Wayne State University,

Detroit, Michigan

In partial fulfillment of the requirements

for the degree of

DOCTOR OF PHILOSOPHY

2010

**MAJOR: EDUCATIONAL LEADERSHIP AND
POLICY STUDIES**

Approved by:

Advisor

Date

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DEDICATION - WIDMUNG

I dedicate my dissertation to the memory of my mother Hildegard Zeiger Krispien and my sister Monica Krispien-Wriggers, who are sadly no longer among us, and to my beloved husband, Joachim Heribert Kobinger, my rock, who always gave me support and confidence. *Meine Dissertation ist meiner Mutter, Hildegard Zeiger Krispien, und meiner Schwester, Monica Krispien-Wriggers, gewidmet, die beide nicht mehr unter uns weilen, und meinem einzigartigen Ehemann, Joachim Heribert Kobinger, der mich stets unterstützte und mir immer Zuversicht gab.*

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through red tape when I needed assistance to embed my German background in the educational world of the United States. Additionally, I would like to thank Dr. Piliawsky for joining my doctoral committee and providing his support.

I also like to acknowledge the immense contributions of the late Dr. Donald Marcotte in my doctoral program. He succeeded in me finally really liking the science of statistics and its applications, becoming fascinated by all the possibilities of statistical evaluations.

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LIST OF ABBREVIATIONS

ALEC	American Legislative Exchange Council
ANOVA	Analysis of Variance
AYP	Adequate Yearly Progress
CEPI	Center for Educational Performance and Information
CS	Charter School (Public School Academy, PSA)
DetroitMA	Detroit Metropolitan Area
DPS	Detroit Public Schools
GDP	Gross Domestic Product
GPA	Grade Point Average
Ed. Spec.	Degree of Education Specialist
ELL	English Language Learners
ESEA	Elementary and Secondary Education Act
L2K	Personnel Licensing System
LEP	Limited English Proficiency
MEAP	Michigan Educational Assessment Program
MTTC	Michigan Test for Teacher Qualification
NAEP	National Assessment of Educational Progress
NBPTS	National Board for Professional Teaching Standards
NCLB	No Child Left Behind
NCEE	National Commission on Excellence in Education
NCES	National Center for Education Statistics
NESIC	National Education Standards and Improvement Council

NTE	National Teacher Examination
NYSTCE	New York State Teacher Certification Exam
OECD	Organization for Economic Co-Operation and Development
PISA	Program for International Student Assessment
PS	Traditional Public School
PSA	Public School Academy (Charter School, CS)
REP	Register of Professional Personnel
SASS	School and Staffing Survey

*"I am indebted to my father for living,
but to my teacher for living well."*

Alexander the Great (356 – 323 B.C.)¹

*"Those who educate children well are more to be honored than parents,
for these only gave life,
those the art of living well."*

Aristotle, Alexander's teacher, (384 – 322 B.C.)²

CHAPTER I: INTRODUCTION AND STATEMENT OF THE PROBLEM

Introduction

The Romans, the Greeks, the Egyptians, all ancient civilizations, put an enormous emphasis in the concept of "teacher". Those early cultures had realized that their advanced society was in need of highly qualified persons to teach the youth according to the values and the, then, available knowledge of their civilization if they wanted to achieve and maintain a stable and reliable working social system. Education was regarded as one very important pillar of their advanced society. Even the vocabulary used to name a teacher in former times mirrors this concept: the Latin word "magister", the old English word "master", and the old German word "Meister", all stand simultaneously for a person whose profession is teaching and who concurrently is a highly regarded master of his/ her trade.

¹ Siegfried Fischer-Fabian *"Alexander. Der Traum vom Frieden der Völker"*, Georg Lübbe Verlag, 1984, Germany (source in German)

² Siegfried Fischer-Fabian *"Alexander. Der Traum vom Frieden der Völker"*, Georg Lübbe Verlag, 1984, Germany (source in German)

The values may have changed between their times and ours, and the knowledge has certainly grown, but the principle of selecting the most qualified persons to teach the youth, to lay the foundation of the future for a society, even for a civilization, does not seem so absurd in our days. Some countries that are counted to be among the world leading countries today, such as Japan, still hold their teachers in the highest regard, acknowledging their crucial role in their culture, respecting them, and realizing the importance the education of the youth has to build the future of the society.

Without a functioning education system, a society is bound to lose its values, deteriorate in knowledge, and be weakened dramatically in its competitiveness with other societies or nations. In the bigger picture, one might even see the whole civilized world in danger if the people do not step up their level of knowledge to prevent harm from happening; *“Human history becomes more and more a race between education and catastrophe”*, H.G. Wells (1866 – 1946)³.

Concern about the Educational Achievement of Today's Pupils

We live in more and more complicated and competitive times where a good educational foundation for any and every pupil is of more value and importance than ever for the individual and the society. Schools therefore should be aimed at producing graduates who have learnt as much as possible up to their full potential; the more qualified today's graduates are, the better are their job opportunities, the more each individual can contribute in the future to society - and will in return receive from society.

³ H. G. Wells *“The Outline of History”*, vol. 2, Garden City Books, NY, 1961

As far back as 1965, the federal government started to exert influence on the academic outcome of America's pupils. In 1965, Congress enacted the Elementary and Secondary Education Act (ESEA), a United States federal statute, as part of President Lyndon B. Johnson's declared "War on Poverty" of his "Great Society Program". The President who, as a former teacher, had been teaching children from minorities and low socioeconomic background in Texas in the 1920s, strongly believed that public education of a good quality was a vital precondition for the pupils to lead a successful life. The sections of the ESEA law are responsible to set the terms for elementary and secondary education funding for low-income children.

In the year 1983, the publication of "A Nation at Risk" by the National Commission on Excellence in Education, focusing on the debate over the unsatisfactory condition of the American education, caused quite a stir. The assessment of the quality of teaching and learning in the U.S., the comparison of achievement to other industrialized nations, and SAT test score trends between 1960 and 1980 were among the scrutinized objectives. Although the results presented in this "Open Letter to the American People" are not without controversy (some even say the report is outright flawed), it is worth taking a closer look at some of the findings. The outcome of the report is divided into four important aspects of the educational process: content, expectations, time, and teaching. Each of the four segments was found to be in dire need of improvement to prevent the American nation from the risk of sliding into the ranks of nations with, at best, mediocre education. Without improvements in the educational framework, the report predicts a dull future for the American society due to an anticipated lack of competitiveness,

resulting from the low quality of the educational system and therefore providing a working force equipped with lesser skills.

The findings regarding the segment of teaching, especially teachers, mirror in part the results of more contemporary research. Even back in 1983, the teacher education in the subject matter was perceived as too weak, a high number of newly hired teachers were teaching out-of-field, there were serious teacher shortages in science and mathematics, and a high number of teachers had been underachieving pupils themselves, drawn from the bottom quarter of graduation classes.

A few years after the publication of “A Nation at Risk”, in 1990, the Sandia Report took a closer look at the findings of 1983. Most of the results that “A Nation At Risk” reported were contradicted by the Sandia Report, e.g., regarding the decline in SAT test scores, the math proficiency, the competency level in science, or the number of twenty two year old Americans with a bachelor degree compared to “*all developed nations*”⁴.

President George H. W. Bush gathered the nation's 50 governors in 1989 for the first-ever National Education Summit, the School Accountability Summit. Educational objectives for the whole nation were established to support state and local standards with the goal to meet them by 2000. Among the six adopted objectives were, e.g., that American students should “leave the 4th, 8th, and 12th grades having demonstrated competency over challenging subject matter, including

⁴ Although this finding may be questionable as some nations, e.g., Germany, did not award a bachelor's degree or anything comparable at this time (a college/ university student graduated with nothing less than a master's degree) and some of the countries with high performing pupils have a very different system of awarding degrees, e.g., the Netherlands.

English, mathematics, science, history and geography" as a means to recover a leading role for America and that the "high school graduation rate will increase to at least 90 percent".⁵

President Clinton's educational law "Goals 2000: Educate America Act", signed March 1994, built on the agenda of the First National Education Summit; it is emphasized that education is not only a responsibility of the state and local authorities but has to become a national priority. President Clinton further coined the National Education Standards and Improvement Council (NESIC) as an authority that had the right to judge whether a state's educational standards were to be approved or rejected. Anyway, with the Republicans gaining control of Congress in 1994, and their fear of an increased federal influence in the education system, no one was ever appointed to serve on the NESIC. The "Improving America's Schools Act", enacted October 1994, reauthorized the ESEA of 1965 demanding as two major issues the setting of high expectations for all students and the connecting of professional development of the teachers to these higher expectations.

Further on, there is the demand by the No Child Left Behind (NCLB) legislation of 2001, the current reauthorization of the ESEA from 1965, that every Title 1 child has to have a highly qualified teacher⁶, claiming that

⁵ Retrieved from http://www.ed.gov/pubs/Prog95/pg_6toc.html March, 8th, 2009

⁶ The definition of a highly qualified teacher by NLCB: "All teachers of core academic subjects in the classroom have to be highly qualified. This is determined by three essential criteria: (1) attaining a bachelor's degree or better in the subject taught; (2) obtaining full state teacher certification; and (3) demonstrating knowledge in the subjects taught", retrieved from <http://www.ed.gov/nclb/methods/teachers/stateplanfacts.html>, May 29th, 2008.

“States and districts that wanted to participate in Title 1 had to develop a plan to ensure that poor and minority children are not taught at higher rates than other children by inexperienced, unqualified, or out-of-field teachers”.

Finally, the American Recovery and Reinvestment Act, enacted in 2009 by the Obama administration, contains the “Race to the Top” program⁷, that offers up to \$4.35 billion in sum for states that show progress and improvement in their educational system. The states apply for the funding and will be judged by a catalogue of criteria (e.g., improving teacher effectiveness based on performance, turning around the lowest achieving schools, developing and adopting common standards). In the first phase, 2 out of 41 applicants were awarded extra funding (approximately \$500 million for Tennessee and \$100 million for Delaware) to “implement their comprehensive school reform plans over the next four years”⁸. Although this program seems to be a promising step towards increasing the educational outcome of the pupils, teachers’ unions and some states (e.g., Texas, Virginia) are dismissive towards participation because they object to any kind of interference from the federal government, to any raise of the federal influence in the states’ educational agenda.

Even though the funding of America’s schools increased over the last decades (adjusting for inflation and comparing in 2006 dollars the expenditures per pupil in the fiscal year 2006 have grown 25.1% since fiscal year 1995 and 51.0%

⁷ Official information regarding the “Race to the Top” program retrieved from <http://www2.ed.gov/programs/racetothetop/index.html>, June 27th, 2010.

⁸ Data retrieved from <http://www2.ed.gov/news/pressreleases/2010/03/03292010.html>, June 27th, 2010

since fiscal year 1985)⁹, the educational outcome of the public school system is more under fire than ever before. The expectations in pupils' academic performances are higher than in past years; the society is currently calling for an improvement in the educational outcome. To achieve this obviously necessary improvement, educational institutions have to focus on the resources that contribute the most to the academic achievement of their pupils.

A growing body of research confirms that the teacher is one of the most important – if not the single most important – measurable variable in the school system regarding the contribution to pupils' learning (Betts, Rueben, & Dannenberg, 2000; Darling-Hammond, 2000; Sanders & Rivers, 1996; Goldhaber, Brewer, & Anderson, 1999; Goldhaber & Brewer, 2000). Other measurements of school input, e.g., class size, school size, or location of the school (rural, suburban, urban), do not show the same consistent significant influence on the educational achievement of the pupils. Consequently, the scrutiny of the quality of a school's teaching personnel will substantially improve our understanding of the academic outcome of the pupils.

However, the realization of the importance of high quality teachers for optimized educational achievement does not solve the problem in a somewhat simple way that schools can just start to look for "high quality teachers", because it is in no way easy to determine what exactly predicts that a teacher will be an effective teacher. A high number of measures of teacher quality is used in past and current

⁹ Data retrieved from <http://nces.ed.gov/pubs2008/expenditures/findings.asp>, *Revenues and Expenditures for Public Elementary and Secondary Education, School Year 2005–06 (Fiscal Year 2006)*, January 3rd, 2009.

research; these measures range from formal credentials like teacher's high school education or certification status to personality characteristics like enthusiasm or integrity. Some studies even discuss whether schools should look for teaching quality or teacher's quality. No definition of a qualified teacher is easily at hand. The available research regarding teachers' assessment using proxies results in few reliable predictors, sometimes even in contradictory results.

Educational Map of Michigan: Current Student Body and Achievement

Michigan consists of 552 school districts, 4,090 public schools, and 264 charter schools¹⁰. A total number of 1,741,845 children are enrolled in the Michigan school system¹¹. About half of the charter schools and about one third of the student population of Michigan are located in the Detroit Metropolitan area.

The Detroit Metropolitan area, represented by the three counties of Wayne, Oakland, and Macomb, offers a large variety of schools, covering the range from low-income schools in impoverished neighborhoods to high-income schools in affluent areas. This area includes schools with a high percentage of minority pupils and schools with (almost) no minority pupils, suburban schools, rural schools, and urban schools, and even a relatively high number of charter schools. The whole spectrum of "school" is represented in this area (table 1: Schools in the Counties of Wayne, Oakland, and Macomb, 2006).

¹⁰ Year 2006, retrieved from schooldatadirect.org, October, 5th, 2008

¹¹ Year 2006, retrieved from schooldatadirect.org, October, 5th, 2008

Table 1: *Schools in the Counties of Wayne, Oakland, Macomb, 2006*¹²

	Wayne	Oakland	Macomb
Districts	34	28	21
Number of Pupils	268,484	193,295	135,225
Traditional Public Schools	657	348	240
Charter Schools	98	21	11

The student body shows a high number of minority and low-income children attending some of the schools in the Detroit Metropolitan area (table 2: Student Body in Wayne, Oakland, and Macomb (in %)). In general, Michigan sports a slightly above nationwide average proportion of black pupils (17.9%). In Wayne, this number is even higher at 44.6%, and Wayne enrolls a high number of economically disadvantaged pupils¹³ (50%), and a relatively high percentage of students that are eligible for free or reduced lunch. Due to prior research, these groups of children, the economically disadvantaged and the black pupils, are suspected to fall in the category of low-achieving pupils; therefore, the academic achievement of these groups should be scrutinized.

¹² Year 2006, retrieved from schooldatadirect.org, October, 8th, 2008

¹³ According to established research, this study defines economically disadvantaged pupils as pupils who are eligible for free or reduced lunch

Table 2: *Student Body in Public Schools in Wayne, Oakland, Macomb (in %)*¹⁴

Ethnic/ Socioeconomic Background	Nation	State	Wayne	Oakland	Macomb
	2007	2008	2008	2008	2008
White	55.0	73.1	47.4	71.1	81.9
Black	16.6	17.9	44.6	18.5	11.6
Hispanic	21.1	4.7	4.8	3.0	1.9
Asian/Pacific Islander	4.6	2.6	2.4	6.4	2.9
American Indian/Alaskan Native	1.2	0.9	0.4	0.4	0.6
Economically disadvantaged	41.8	36.9	50.0	21.2	26.2
- Receiving free lunch		30.5	44.6	16.8	20.4
- Receiving reduced price lunch		6.4	5.4	4.4	5.8

Among the three counties of Wayne, Oakland, and Macomb, especially the composition of the student body in Wayne is eye-catching. A high number of pupils, more than twice the nationwide or statewide average, is black (44.6%) and literally every second student is considered economically disadvantaged. In Macomb, on the other hand, the number of black students is as low as 11.6% and only one out of four pupils falls in the category of economically disadvantaged students.

Regarding merely charter schools, the picture is not homogenous at all. Depending on the location of the charter school in the Detroit Metropolitan area, the percentage of black pupils may be as high as 99.5% (e.g., Conner Creek in

¹⁴ Data retrieved from schooldatadirect.org, February, 5th, 2009

Macomb) or as low as 6.9% (e.g., Oakland International Academy in Oakland). The AGBU Alex-Marie Manoogian School (Oakland), the Macomb Academy (Macomb), or the Henry Ford Academy (Wayne) sport 0% of children eligible for free lunch; on the other hand, at the Frontier International Academy (Wayne) almost any and every one of the pupils is eligible for free lunch (97%). The Plymouth Educational Center (Wayne) sports a student body consisting of 100% black pupils, none of them eligible for free (or reduced) lunch, their achievement scores are way above the achievement scores of public schools in Detroit, and the school reports the 6th highest average teacher salary of 109 charter schools in the tri county area.¹⁵

A common measurement of pupil's academic achievement is the student's standardized test scores. These standardized test scores are publicly provided through the National Assessment of Educational Progress (NAEP), commonly named The Nation's Report Card, the leading national assessment tool to determine the knowledge of the pupils. Congress established NAEP in 1969 with the intention to be able to compare pupils' educational outcome across states and time, to provide a regular benchmark for states and the nation, to measure the educational achievement of the nation, to monitor progress in achievement over time, and to measure the impact of educational policies in distinctive states. National assessments include pupils in public and private schools, the statewide assessments are conducted in public schools only. Lately results for selected urban districts (e.g., Chicago or Los Angeles) or regions (e.g., Midwest) are additionally available.

¹⁵ Data retrieved from schooldatadirect.org, February, 5th, 2009

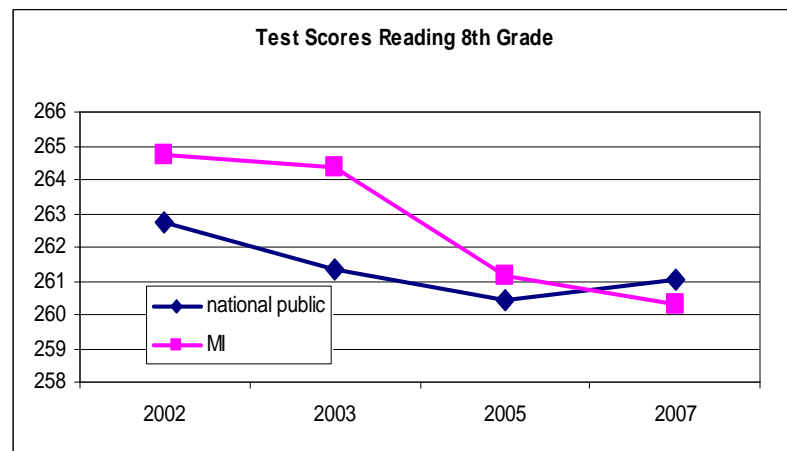
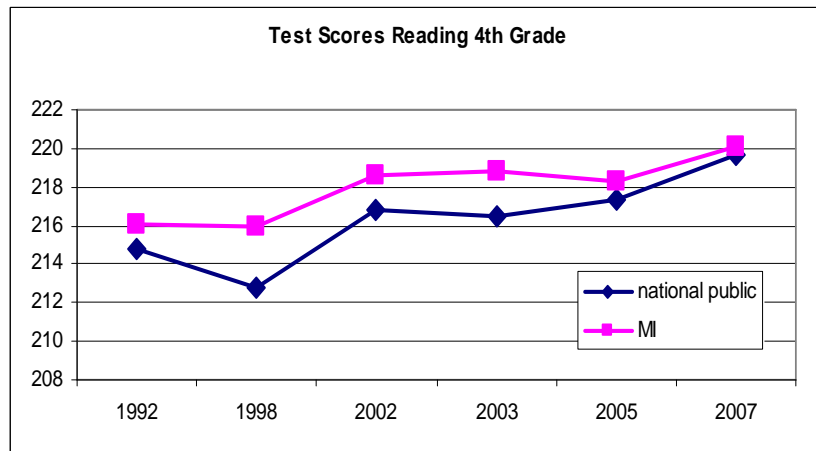
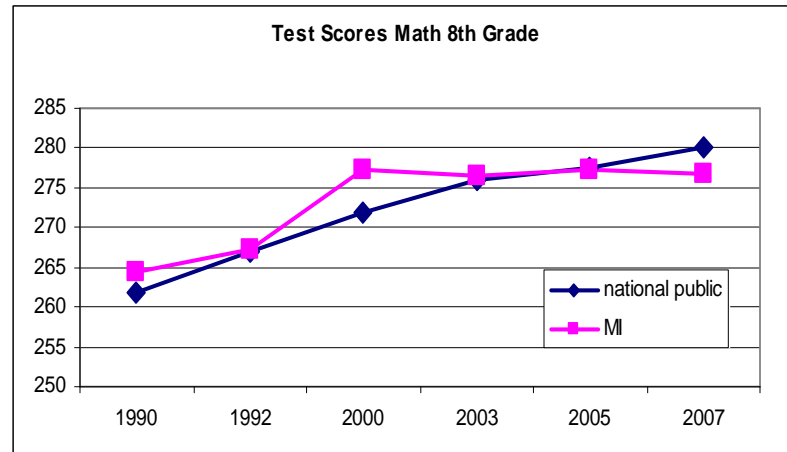
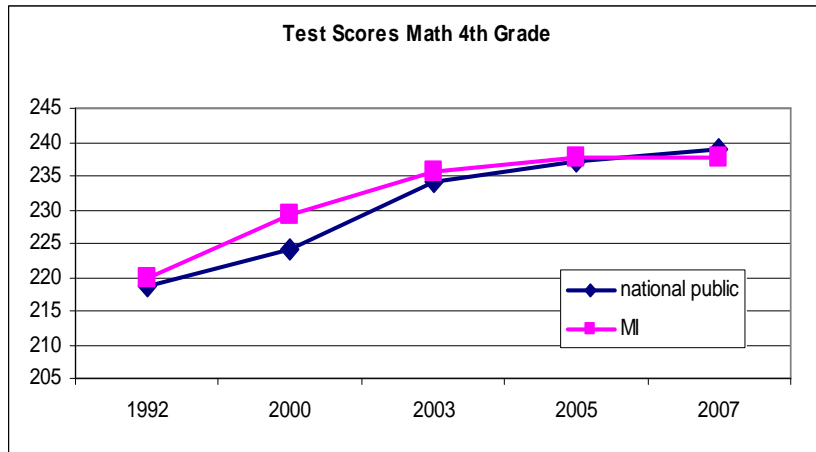
Since 2003, the No Child Left Behind Act (NCLB) demands that school districts have to participate in the NAEP if they aspire to receive federal funding to support their economically disadvantaged students. Every second year, the knowledge in reading and mathematics at grade levels 4 and 8 is assessed via a selection of 3,000 students in each state for each grade and subject, including English language learners (ELL) and students with disabilities (SD). Further participation in other assessments¹⁶ is optional. As of winter 2007, all fifty states and additionally the District of Columbia (and Department of Defense Education Activity), plus ten urban districts (on a trial basis), participated in the assessment of reading and mathematic achievement at grade levels 4 and 8.

Evaluating the NAEP data, the test scores in reading and mathematics, 4th and 8th grade each, show a trend in Michigan that gives reason for concern (figure 1: Test Score Trend in Michigan). The test scores in mathematics, grade 4, in the interval from 1992 to 2007 started being slightly above the national average, but continued to level out slightly below the national average. Contemplation of mathematics assessment, grade 8, in the interval from 1990 to 2007 results in the finding of a similar tendency. The test scores, once above national average, level out below national average, only with a larger margin. In reading, the picture presented is similar. In 1992, the measured achievement of Michigan's pupils in reading, grade 4, was above the national average; during the years up to 2007 the test scores in Michigan leveled down to finally be basically the same as the national average. The

¹⁶ Additional subjects are foreign language, science, economics, U.S. history, civics, writing, arts, world history, geography, additional grade level is 12th grade and additional age groups (ages 9, 13, and 17) are assessed.

assessment for reading at grade 8 displays an even more troubling trend. In 2002, the test scores were well above national average; in 2007 the assessment showed results slightly below national average. The general picture is unsettling but homogenous; the assessment of pupils' academic outcome in Michigan shows a decline, a tendency to level out below the national average.

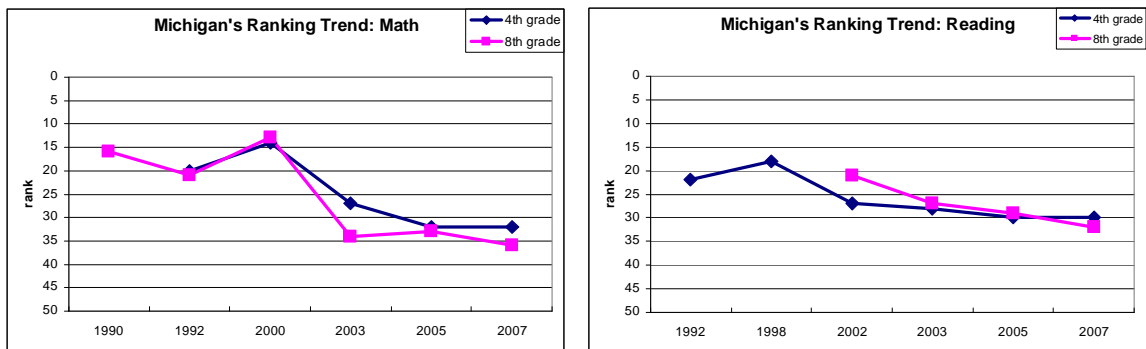
Figure 1: Test Score Trend in Michigan¹⁷



¹⁷ Data retrieved from <http://nces.ed.gov/nationsreportcard/states/>, October, 2nd, 2008

A look at the ranking trend of test scores provided by the NAEP data for Michigan's students, reading and mathematics, grade 4 and 8 each, is not soothing either (figure 2: Michigan's Ranking Trend among the other States). In the examined time period, Michigan's top ranking in mathematics was 13th, only to fall down to be the 32nd among 50 states plus D.C.. The ranking in reading does not show better results. The best ranking between 1992 and 2007 resulted in 18th among 50 states plus D.C., only to level down to 30th (for 4th grade) respectively 32nd (8th grade) in 2007. These results give reason to be deeply concerned about the low achievement of Michigan's students.

Figure 2: *Michigan's Ranking Trend among the other States*¹⁸

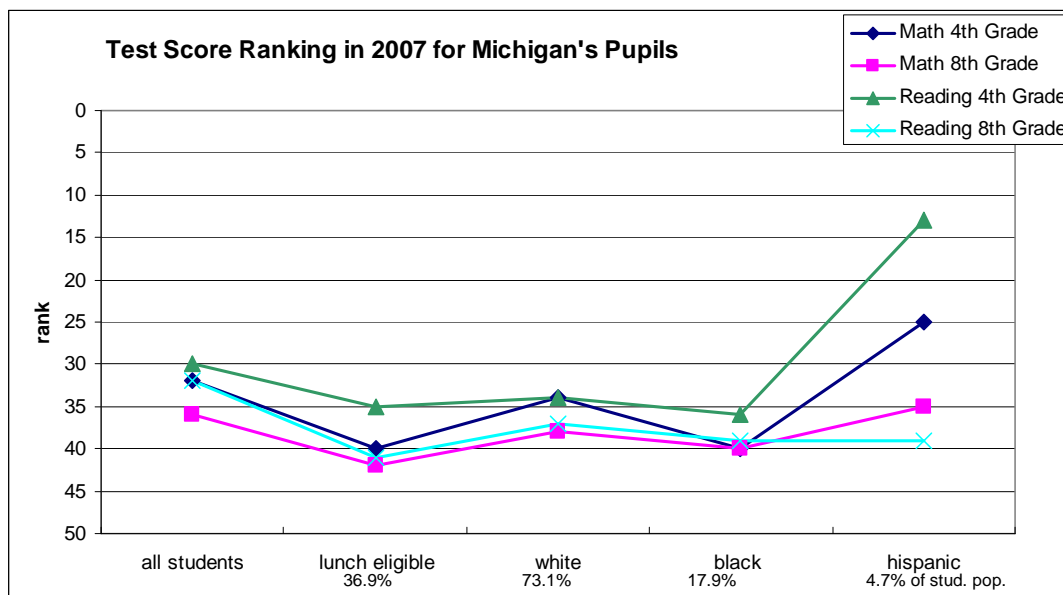


Assessing student groups with a different background (socioeconomic status, ethnicity), the results get worse, especially for black pupils and pupils eligible for free or reduced lunch (figure 3: Test Score Rankings in 2007 in Michigan for diverse groups). White pupils and especially the Hispanic student population receive the

¹⁸ Data retrieved from <http://nces.ed.gov/nationsreportcard/states/>, October, 2nd, 2008

best rankings compared to the respective groups in the other states. Nevertheless, even comparing the ranking of those groups (white students are never better ranked than 34th place) to the other states gives reasons for concern (the only exception is basically Hispanic students in 4th grade reading, where they rank among the top 15).

Figure 3: *Test Score Rankings in 2007 in Michigan for Diverse Groups*¹⁹

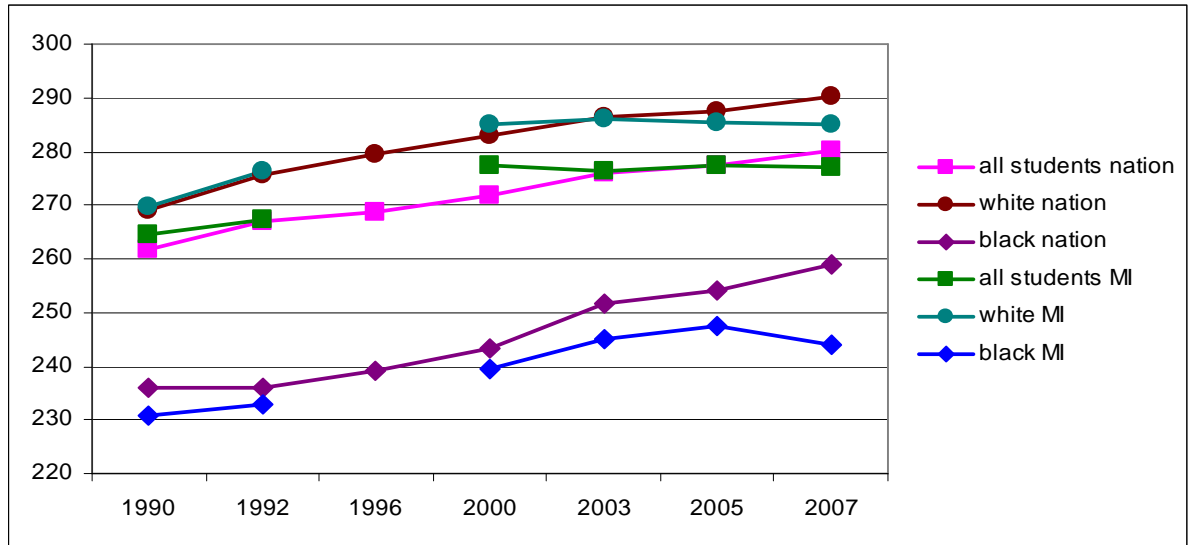


Further, more detailed analysis of the NAEP 2007 results for ethnic groups in Michigan leads to outright alarming results. In mathematics, grade 4, black pupils rank 40th of 45 reporting states, reading, grade 8, shows black and Hispanic students at the 39th rank (of 42 states reporting). Finally, mathematics, grade 8, positions black pupils at the 40th ranking place of 41 states reporting. The national average

¹⁹ Data retrieved from <http://nces.ed.gov/nationsreportcard/states/>, October, 2nd, 2008

score for all students in mathematics, grade 8, is 280 (with the highest score of 298 in Massachusetts and District of Columbia sporting the lowest score with 248); the score for Michigan's students lies at 277, just slightly below the nationwide average. The national average score for black pupils is 259, with the highest score of 272 in Oregon and Colorado and the lowest score in Nebraska with 240; the score for black students in Michigan of 244 should raise red flags and give urgent reason to consider educational policies to change this situation dramatically.

A closer look at the development over time of the test scores for different ethnic groups emphasizes the severity of the trend in the achievement gap regarding black and white pupils (figure 4: Achievement Gap over Time, 1990 to 2007). Considering the group of all students or white students nationwide or in Michigan and considering black students nationwide, the scores show generally a yearly increment, at any rate they stayed constant, between 1990 and 2007. On the other hand, the group of black pupils in Michigan, already the lowest scoring group, is the only group that shows a slight decline in scores, opening the achievement gap up instead of closing it down.

Figure 4: *Achievement Gap over Time, 1990 to 2007*²⁰

Looking at the big picture of educational outcomes, the ranking of Michigan's pupils is even more alarming when the international floor, the international achievement map, is considered. In 2000, the Program for International Student Assessment (PISA) was first implemented²¹. PISA is a platform that provides a system of international assessments that measures 15-year-olds' performance in reading literacy, mathematics literacy, and science literacy every three years, by focusing on the application of knowledge to problems with a real-life context instead

²⁰ Data retrieved from <http://nces.ed.gov/nationsreportcard/>, February, 24th, 2009

²¹ Before the utilization of PISA, the first comparative study of student achievement in mathematics worldwide, the First International Math Study (FIMS), had been conducted in the 1960s, the Second International Math Study (SIMS) in the 1980s, the Third International Mathematics and Science Study (TIMSS) in 1995, and the more comprehensive study of international student performance in math and science (TIMSS-Repeat), in 1999. In those studies, the measured educational outcome for the pupils in the U.S. in comparison to students in the other participating nations was equally low and disappointing, as were the PISA results in later years.

of focusing on curricular outcomes. The organization that sponsors this program is the Organization for Economic Cooperation and Development (OECD), an intergovernmental organization consisting of 30 member countries²². Pupils from an additional number of 27 non-OECD jurisdictions²³ were included in the 2006 assessment.

The main focus of the 2006 PISA was set on science literacy; therefore, the following will regard the results measured in this field. The data resulting from the PISA 2006 report rank the academic achievement of public and private school pupils in the U.S. in science literacy statistically significantly lower than the achievement of students in 16 OECD-jurisdictions and 6 non-OECD-jurisdictions. When distinctions for race/ ethnicity are made, the picture gets even more disturbing. Black pupils in the U.S. score significantly lower than pupils of every other race/ ethnicity score in the U.S. The OECD average is set at a score of 500 (each year), the U.S. average resulted in 489 for 2006 (in 2003 it was at 491 and in 2000 the score was 500), with white students scoring 523 on average and black students scoring an average low of 409. In 2000 and 2003, a similar pattern by race/ ethnicity was found (Lemke et al., 2001, 2004). Only one OECD-jurisdiction had a comparable low score (pupils in Mexico had an average score of 406). The analysis of PISA illustrates that not only

²² Member countries of the OECD jurisdiction are Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Republic of Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, United Kingdom, and United States.

²³ Argentina, Azerbaijan, Brazil, Bulgaria, Chile, Chinese Taipei, Colombia, Croatia, Estonia, Hong Kong-China, Indonesia, Israel, Jordan, Kyrgyz Republic, Latvia, Liechtenstein, Lithuania, Macao-China, Qatar, Republic of Montenegro, Republic of Serbia, Romania, Russian Federation, Slovenia, Thailand, Tunisia, Uruguay.

does the U.S. score below expectations, but that the results of the black pupils are totally unacceptable when put in a bigger context.²⁴

Putting all the information together, the international ranking of the U.S., the ranking of black students in the U.S., the ranking of Michigan among the states, and the test scores of black pupils in Michigan, the overall achievement map of Michigan gives reason for concern about the educational outcome. Improvement in the pupils' achievement is clearly desirable. One means to accomplish this is to focus on one important educational input: the teacher, specifically the quality of the teacher. In the following sections the concept of "teacher quality" and the attributes linked to a high quality teacher will be discussed due to the importance of teachers in relationship to student outcome (Rivkin, Hanushek, and Kain, 2005; Rockoff, 2004; Aronson, Barrow, & Sanders, 2003).

When the focus is on improving the educational outcomes of the pupils, Ingersoll (2002) splits this subject into two perspectives: the teacher deficit perspective and the organizational perspective. First, I will discuss the teacher deficit perspective in focusing on the identification of teaching talent; the organizational deficit perspective will be covered later on when the hiring and sorting process of teachers is discussed.

Identifying Teaching Talent

Half a century ago, school court cases started to occupy the legal system of the United States (one of the most significant turning points was Brown vs. Board of

²⁴ Data: Baldi et. al. (2007)

Education²⁵, as far back as 1954). Wealth related (measured in property tax base per pupil) and race related disparities in school resources were scrutinized; equal educational opportunities, requiring a similar schooling quality provided to pupils across schools, were examined. This input standard can be regarded as a standard of “input equality”; it is easier to assess than an outcome standard, which would require a definition for educational outcomes and a means of assessing their achievement. Deviations from a weaker input standard are easier to measure (e.g., in categories like class size, per pupil spending, ratio of pupils per teacher) and to correct.

Using the quality of the teachers as a proxy for the educational input provides a measure for comparisons across schools, as the link between teacher qualifications and educational outcome of the pupils has been shown to be a strong one: the quality of teachers is expected to matter highly in relationship to pupils’ achievement in schools.

When it comes to identifying teaching talent, the terms “qualified teacher” or “effective teacher” are most often utilized in educational literature. However, there does not exist one single, unanimous definition of the desired attributes of teachers. Instead there are a number of attributes, described as desirable qualities for teachers, which have been used in empirical research as indicators of or as proxies for “teacher quality” (even among these attributes the value, the definition of them, may be different from state to state as, e.g., the states have different, widely varying,

²⁵ In *Brown vs. Board of Education* the U. S. Supreme Court ruled that “separate educational facilities ... [for white and black students] ... are inherently unequal”, therefore racial segregation was declared to violate the Fourteenth Amendment of the Constitution.

standards and procedures for teacher certification). All these attributes are described as having a strong relationship to the educational outcome of the students, to influence their learning results in a positive way. A qualified teacher owns these attributes, or some of them, in a certain depth.

Examples of attributes that are held responsible to have a significant influence on students' achievement and are measurable as an element of school inputs are the highest degree a teacher has earned, the kind of professional licensure a teacher has, the teaching experience measured in years (an inexperienced teacher is generally regarded as a teacher with less than 3 years of teaching experience), the deep knowledge in content area (measured in coursework taken), and the presence of certification in the subject area. Other used attributes are, e.g., the teacher's test scores in exams, whether he/ she failed to pass the accreditation exam at the first try, success or failure to obtain National Board for Professional Teaching Standards (NBPTS) certification, competitiveness of undergraduate institution (e.g., according to Barron's ranking), and high scoring on basic skills tests or college entrance exams.

Qualifications such as education, training, and experience are only indirect measures of teacher quality; nevertheless, most researchers concluded that they are still useful indicators to measure the quality of teachers (Haertel, 1991; Haney, Madus, & Kreitzer, 1987; Kennedy, 1992).

Some studies discuss a very broad range of teacher's attributes, like Darling-Hammond (2000): verbal ability, adaptability, creativity, subject matter knowledge, understanding of teaching and learning, specific teaching skills, experience in the

classroom, fit between teacher's assignment and teacher's knowledge and experience. This list of attributes can be continued, modified, or only partially used to describe the qualifications of a teacher; additionally, new proxies or indices for teacher quality might be tested. Depending on the available data for research, the attributes that are presented and measurable with the data set will be picked to describe a qualified teacher and to test a theory.

Among the more significant teacher attributes are the level of his/ her certification, the degree a teacher has earned and the preparation program in which he/ she had participated. The coursework and the teacher's test score also rank high in the significance, followed by the teacher's experience. The meaningfulness of these attributes will differ for different levels of schooling; generally the influence of these attributes on educational outcome is more significant in the high school level, or even in middle school. In the elementary school level, the influence will be lesser or insignificant.

The teaching staff in Michigan includes 3.2% teachers that are uncertified or on emergency waivers, 5% of the teachers are not certified in their main teaching assignment, 80% teach only one field, and 30% that teach a second field are not qualified in this second teaching assignment according to the definition in NCLB (Harris & Ray, 2003). In times when policy makers are looking for ways to improve the low academic achievement of pupils and ways to close achievement gaps across schools, in times when parents go to court to seek educational adequacy for their children, in times when research has shown a relationship between teachers and students' academic achievement, the scrutiny of distribution patterns of teachers

across schools, with regard to the attributes of the pupil population, should be of highest interest to policymakers and everybody who is, in any way, involved in the sorting process of teachers. In this context, the definition of “teacher sorting” will be understood as the nonrandom distribution of teachers across schools and student groups.

Hiring Practices

One parameter in the hiring process of teachers is the teacher union and their work rules, e.g., seniority rules. In the case of strong seniority rules, veteran teachers may be able to pick their assignment or may be given out-of-field teaching assignments. These rules, found in the collective bargaining agreements of each district, may be very different from one school district to another. The effects of these rules may even sum up to a high number of under qualified teachers when a teacher is assigned to a subject in which he is not fully certified. Hiring policies and staffing practice of a school or a district, e.g., hiring of an available but under qualified teacher at the cost of a regular teacher salary, choosing to reassign an existing teacher to cover part or all of the hard-to-staff classes at no additional salary, or employing a long-term substitute teacher at a relatively low salary may lead to a teacher that is not qualified to teach in his/ her current assignment. Especially in subjects like social studies or language arts there is evidence of teacher surpluses; therefore, theoretically, no out-of-field teaching should have to occur in these subjects. However, the reality draws a different picture: even in these subjects out-of-field teaching happens.

The hiring of teachers may be done as a scientific match between the attributes of a teacher and the attributes of a school or it may be a political match, where the actual matching of the teacher's unique qualities and the schools' necessities are not in the center of the decision-making. Some schools/ districts might even refrain from an expensive hiring process (time and money intensive) and utilize less sophisticated means to hire new staff. Sometimes, a school might even decide to employ a less qualified teacher to save some salary; disadvantaged schools might demonstrate a prevailing preference to hire lower salaried staff, this way ending up with teachers of a lesser quality.

In Wayne, there are, e.g., schools with diverse educational outcome and diverse hiring practices: Finney High School and Grosse Pointe High Schools. Finney High School, a member of the Detroit Public Schools, is one of the lower achieving schools, especially in math, where pupils score low on college entrance exams. At Grosse Pointe High Schools, members of the Grosse Pointe Public School District, the pupils score above state level and show a better outcome in college entrance exams. In the Detroit Public Schools, the collective bargaining agreement puts a large emphasis on the balanced staff concept when hiring teachers: *"In order to implement the balanced staff concept: In filling vacancies and/or when a school's staff is increased or decreased, appropriate assignments or transfers will be made .. giving priority to the balanced staff concept elements in the following order: necessary qualifications to teach such area and grade level, race, experience, and*

sex”²⁶. The Grosse Point Public School District states in his collective bargaining agreement, that *“to the extent possible, only teachers who possess the highest qualifications, as determined by the Board, shall be given consideration for employment ... [and] ... preference in the employment of new teachers shall be given to those candidates with successful professional experience related to the assignment “*²⁷.

In fields like math and science (particularly physics and chemistry), there is a considerable shortage of teachers in Michigan and in the whole United States; in contrast a considerable surplus of elementary school teachers is reported (American Association for Employment in Education, 2007). This imbalance of supply and demand leads to distinctively different situations for those two groups of teachers. An elementary teacher has fewer chances for a choice when he/ she is applying for a (new) teaching job, because the demand for an elementary teacher is substantially less than the demand for a math or science teacher. The math/ science teacher on the other hand will have more choices in employment because his/ her expertise is in high demand. So generally, when a teacher is taking on a new job, there is a difference between a teacher who is assigned to a job and a teacher who is able to decide actively which job he/ she wants to take up.

²⁶ Retrieved January 21st 2009 from http://www.mackinac.org/archives/epi/contracts/82010_2005-06-30_AFL-CIO_E_X.PDF

²⁷ Retrieved March 3rd 2009 from http://www.mackinac.org/archives/epi/contracts/82055_2009-08-31_GPEA_MEA_E_X.PDF

Sorting Process of Teachers

Obviously, there exists a group of generally highly desirable attributes for teachers. In this context, the working definition of “sorting” will be understood and defined as the nonrandom distribution of teachers across schools, respectively school districts, and student groups. In case of evidence for unequal distribution of teachers regarding their qualification across distinctive groups of pupils, the pupils will be clustered by their socioeconomic status or achievement level (data regarding race are not available at this time).

Teachers obeying the rules of the labor market will follow a path that contributes to their career goals, that offer monetary and other reward. Likely, the lesser qualified teachers will teach in less affluent neighborhoods; to address the low academic outcome of pupils in these schools one focus can therefore be to try to achieve a better match between pupils’ needs and teachers’ qualifications.

Another aspect of the distribution of teacher quality across schools or districts is related to court cases in school finance. These court cases center either on wealth-related disparities in per pupil spending or race-related disparities in per pupil spending. The distribution of teacher quality across schools and districts mirrors both of these aspects of disparities. Districts in wealthier communities have more means available to invest in their schools, in the education of the more affluent pupils; districts with high percentages of minority pupils (in Michigan represented by African-American pupils) have usually less means and less options to improve the learning environment of their population.

Another approach to examining teacher sorting is to scrutinize the collective bargaining agreements of the districts. In some schools/ districts, the rules for seniority teachers will contribute to an uneven distribution pattern of qualified teachers; e.g., teachers with high seniority, veteran teachers, may be able to pick their assignment instead of being assigned to a teaching job or being assigned to a new or high need school. It has to be considered whether the teachers, themselves, determine at which school they are going to teach, or whether they are assigned by district policies. This sorting process within a district has to be regarded when evaluations are made about teacher sorting.

If data regarding the teachers' qualifications for a number of successive years were available, the movement of the teachers from one teaching location to another could be depicted. The focus then should be set especially on the teachers who own the desired attributes and on their movement from one employment to the next, from one school/ district to the subsequent school/ district. A pattern where the more qualified teachers start their careers and where they finally end up teaching - or if they leave teaching to enter another profession - may show in the ongoing sorting process.

Overall, the distribution of teacher quality will help identify at which places it is obviously more or less desirable to teach.

Teacher Training in another Leading Country: Germany

In Germany – and other nations – the training of teachers undergoes a different set of rules. When preparing for a teaching career in Germany, the prospective teacher has to go to college (generally a minimum of four years, eight

semesters, with usually more than 24 credits per semester), graduate (with a master's degree) with a major in every subject that one will later on teach (the minimum requirement is graduation in two different subjects), and do an internship for eighteen months. Finally, to complete this internship, a number of sessions in class will be assessed and graded. Further on, a number of pedagogic seminars have to be passed. The depth and level of this education depends on the grade level and the kind of school the prospective teacher will later work in, but no teacher without the proper college degree will be allowed to teach²⁸. After grade 4, the German school system splits up into three tiers: Hauptschule (graduation in grade 9, lowest tier), Mittelschule (graduation in grade 10, intermediate tier) and Gymnasium (graduation in grade 12 or 13, highest tier, graduation from the Gymnasium is a mandatory precondition to go to university). Then the distinction is made between elementary (grade 1 through 4), middle (grade 5 through 10) and high (grade 11 through 12, respectively 13) school.

According to the kind of school and the grade level, there is a difference in the intensity of the teacher training. Teachers who are going to teach at special education or trade schools (vocational training²⁹) undergo a separate training track because of the distinctive pupils, but their college education spans at any rate four

²⁸ There are extremely rare exceptions to the rule, e.g. if a school offers Chinese as a language, the teacher may either not have formally studied the language at an accredited college (he/she may be a Chinese teacher who studied a different topic than his/her mother language) or may have studied the language but not teaching as a profession.

²⁹ Vocational training is highly regarded in the German education system. A student has to have a working contract with a company accredited by the Chamber of Industry and Commerce, goes to school (part-time and compulsory), and, after (generally) three years has to pass an oral and written exam hold by the Chamber of Industry and Commerce in cooperation with the trade school.

years as well. Therefore, leastwise the formal qualification of the teachers at each cluster of schools is almost identical. The concept of teacher quality distribution is somewhat more difficult to test, because the formal parameters for any and every teacher (in a comparable teaching position) are practically identical. What may differ besides the character traits of a person is the ability of putting the knowledge of teaching methods to optimal use, but this is a harder to measure part of teacher quality than formal qualification. When a school hires a teacher, the focus is therefore more on qualities that are part of a person's character (like enthusiasm, authenticity, being a role model).

A View over the Rim of the Educational Plate

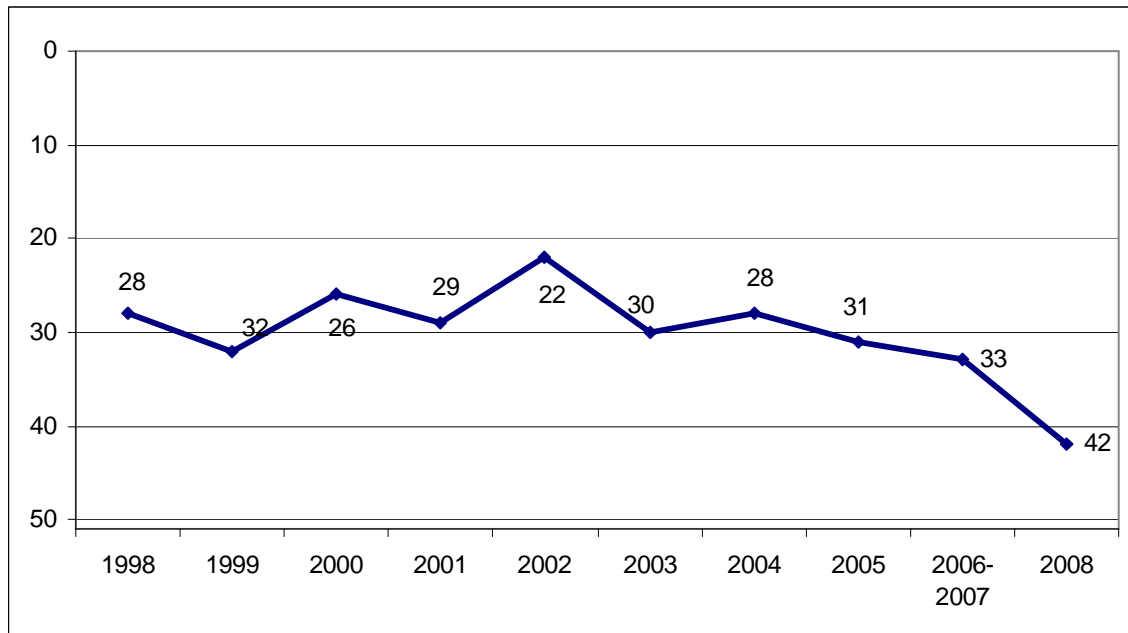
The concerned focus on educational improvement and the thoughts and questions regarding the current situation in schools do not stop with the educational fold or at the border of the U.S. Companies and organizations beyond the educational circle understand the quest for educational achievement in schools, for the best possible educational achievement of pupils, as an important step to invest in improving the society and building a stable future.

One example is the "New Commission on the Skills of the American Workforce", a non-profit, bipartisan panel, that published "Tough Choices, Tough Times" through the National Center on Education and the Economy in 2007. The commission regarded the state of the American education in comparison to international competitors and their recommendations to policymakers were unambiguous. They advise strongly to adopt international educational standards to raise the performance of the American pupils from their current ranking position

(between middle to bottom of all students) and to increase the number of persons entering the workforce with a high school diploma. Regarding the teachers' education, they suggest increasing the currently extremely low number of teachers being recruited from the top third of the high school graduates drastically and demand at least a bachelor's degree for newly hired teachers.

Another example is the American Legislative Exchange Council (ALEC)³⁰, founded 1973, a non-partisan, non-profit membership association of state legislators and private sector policy advocates (Alec has approximately 2,000 legislative members representing all 50 states). Representatives of major corporate and foundation sponsors advise ALEC and ALEC is governed by a Board of Directors. A yearly state-by-state analysis of educational parameters ("Report Card on American Education") is one report among others that ALEC publishes. Their ranking of Michigan's educational achievement is a little bit more flattering, but still nothing to be proud of (figure 5: Educational Ranking of Michigan according to ALEC). Over the years, starting in 1998, Michigan dwindled between the 22nd and the 42nd rank of 51 states (including D.C.), with the 42nd rank being the latest assessed in 2008.

³⁰ *"The mission of the ALEC :... to advance the Jeffersonian principles of free markets, limited government, federalism, and individual liberty, through a nonpartisan public-private partnership of America's state legislators, members of the private sector, the federal government, and general public..."* retrieved February, 9th, 2009 from alec.org

Figure 5: *Educational Ranking of Michigan According to ALEC*³¹

Another example from beyond the educational fold is McKinsey & Company, an advising consultancy hired by companies - and even governments. Between March 2006 and March 2007, McKinsey evaluated the findings of the PISA 2003 report. In this report, titled *"How the world's best performing school systems come out on top"*, McKinsey assessed the educational system in 25 countries world wide (including the 10 best performing school systems³²). The findings in this paper were not surprising at all; McKinsey concludes that the world's highest performing school systems follow the pattern to 1.) Hire the right people to become teachers,

³¹ Data retrieved from <http://www.alec.org/> October, 2nd, 2008

³² In 2003: Australia, Belgium, Canada (Alberta and Ontario as representative provinces), Finland, Hong Kong, Japan, Netherlands, New Zealand, Singapore, South Korea, source: OECD's (Organization for Economic Co-Operation and Development) Program for International Student Assessment

2.) Maintain their training to be/ stay effective instructors, and 3.) Make sure that the distinct school system provides the best possible support and instruction to raise each pupil's standard.

Purpose of the Study

With the continuous national debate about equality of educational opportunity, measured by equal access to qualified teachers, and the problem of disadvantaged school districts being unable to match salaries, benefits, and resources offered by more affluent schools, an important research and policy question concerns the distribution of teacher quality in the Detroit Metropolitan area.

The purpose of this study is to assess the distribution of teachers, focusing on attributes that describe qualified teachers, in the Detroit Metropolitan area, consisting of the three counties of Wayne, Oakland, and Macomb. The data are provided by the State of Michigan's Register of Personnel (REPP) and the state's Educator Licensing Database (L2K). Additional data on school district finances and student characteristics on achievement (MEAP data) will also be analyzed.

It is of primary interest to find out whether there exists a pattern in the teacher distribution in relationship to a distinct student body. Different aspects of the student population, e.g., socioeconomic background or achievement level of the pupils, will be considered concerning the teachers' qualification level in the school. If data were available for several years, it could even be assessed whether the distribution of the qualified teachers over the districts/ schools had changed over the considered period.

Another phenomenon, the out-of-field teaching, has to receive some attention, because even a teacher who is highly qualified in a number of subjects may become an unqualified teacher if he/ she is assigned to teach out-of-field subjects. Therefore, it is quite important to make the distinction between teacher training and current teacher assignment.

As the three assessed counties contain a high number of charter schools, this research will look into differences between charter schools and regular public schools regarding the distribution pattern of qualified teachers.

Hypotheses to be Tested

The hypotheses that will be scrutinized in this research are:

- H1: Teacher quality is not randomly distributed across schools and districts (across and within) in the Detroit Metropolitan region.
- H2: Urban schools have lesser-qualified teachers than non-urban schools.
- H3: Charter schools have a different teacher body characteristic than comparable traditional public schools; qualified teachers tend to leave charter schools; less qualified teachers tend to stay.
- H4: The teacher quality is correlated to school resources, pupil's characteristics and their test scores; schools with more available resources tend to employ higher qualified teachers, demonstrate higher students test scores, and have lower enrollment numbers for economically disadvantaged pupils.

Limitations of the Study

The presented research incorporates data from the Detroit Metropolitan area in Michigan. The data in more suburban, more rural regions, or other big cities in Michigan might have different characteristics regarding the sorting of the teacher body in relationship to the student body. In states other than Michigan, e.g., in more rural states like the Dakotas, or in more urban states like Massachusetts, or in states with a different population body, like California or Louisiana, there might even be very different peculiarities in the teaching body of schools.

This study includes charter schools (public school academies) and traditional public schools on the elementary and middle school level. Data regarding private schools or parochial schools were not available.

We must keep in mind that all the attributes this study utilizes to measure teacher quality are not truly measurements of the teacher's quality but are proxies, some of them used successfully in prior research to measure teacher's quality. For lack of the existence of unambiguously defined formal measurements of teacher's quality these proxies are the available descriptive attributes that can be used in a study regarding teacher quality. Many other, hard or almost impossible to substitute with proxies, characteristics of teachers may have an influence on student achievement, e.g., flexibility, creativity, adaptability. This research will neglect these harder to measure attributes and will focus on the more commonly used proxies for teacher's quality.

Data regarding the teachers are currently available at the school level for one year (the year 2005-2006). There is the possibility that other years might show

different results when included in the research; and adding data from additional years in this research might show a trend or clarify results.

CHAPTER II: REVIEW OF LITERATURE

The review of literature provides various studies on a large number of parameters that have been tested according to their positive influence on student's academic achievement. One important, almost omnipresent, parameter is the quality of the teacher (Sanders & Rivers, 1996; Goldhaber, Brewer, & Anderson, 1999; Betts, Rueben, & Dannenberg, 2000; Darling-Hammond, 2000; Goldhaber & Brewer, 2000). Nevertheless, even after the implementation of NCLB, which requires a highly qualified teacher for every public school class, there is still the debate going on whether measurable teacher credentials can indeed reliably predict the quality of a teacher or pupil's academic achievement.

As to which attributes describe a "qualified" teacher, there are a variety of indices and proxies assessed in the literature. Some researchers use only a few very general attributes to describe teacher quality, while other researchers use more fine-grained indicators for teacher quality and a higher number of them. More recently a growing number of studies regarding the sorting of teachers and the sources of these sorting movements has been published.

In this research, I will screen four different kinds of studies; these studies are regarding

- the influence of teacher quality on student achievement in general
- the attributes of effective teachers
- the distribution of teacher quality, patterns of teacher sorting
- the sources of inadequacies and inequities in teacher qualifications

The Influence of Teacher Quality on Student Achievement in General

Nationwide research about the relationship between teacher quality, measured in certain attributes, and the educational outcome of the pupils supported generally the importance of a qualified teacher to increase the academic achievement of the students.

Going back as far as assessing school inputs in the 1920s and 1930s, the research of Card and Krueger (1992) shows a connection between school inputs, among them the teachers, and earnings of the graduates in the 1960s and 1970s.

Findings in Ferguson (1991), Ehrenberg and Brewer (1994), and Ingersoll (2001) further support that teacher quality is important for student performance. In the later publication, Ingersoll even rightfully raises the provocative questions why so much research is necessary to scrutinize teacher quality – and to prove the importance of qualified teachers to the public and policy makers – when, on the other hand, relatively little research has been done regarding other professions. Ingersoll even talks about some kind of double standards and rightfully asks if the public opinion might be that teaching does not require any special training or education, that basically everybody can be a teacher.

Other studies support that the relationship between school inputs and student achievement is strong enough to be considered relevant (Hedges, Laine, & Greenwald, 1994). Sanders and Rivers (1996) deduct in a study in Tennessee that teacher effectiveness is indeed positively related to student achievement, for low-, middle-, and high achieving pupils, and further that the lower achieving students are especially benefiting from a more effective teacher. They followed students over a

period of three years and found a stunning difference in the pupils' achievement of up to 50 percentile points - due to the effectiveness of their teachers. For schools in Alabama, the teacher test scores and teacher education have shown to have a consistently strong and positive effect on student learning (Ferguson & Ladd, 1996). Research by Brewer (1996) even supports the hypothesis that the influence of a teacher is more important on the academic achievement of the pupils than the influence of a good administrator. Among school resource measurements in California, the teacher's quality is the measurement most strongly related to pupils' achievement (Betts, Rueben, & Danenberg, 2000).

Another research done in Tennessee (Nye, Konstantopoulus, & Hedges, 2004) confirms that teachers do matter, that teachers in Tennessee have a larger effect on the educational outcome of students than other school inputs - although the researchers come to the conclusion that neither teacher's experience nor teacher's education are generally significantly influencing the academic outcome. Goldhaber and Anthony are backing up the importance of teacher quality in their research paper from 2007 and emphasize that this impact is larger on poor students than on students coming from a higher-income family background.

Even though the research covers different states and different times which are, obviously, very distinctive from each other (regarding historical background, student body, ranking among the states, community characteristics etc.), the findings are startlingly similar: the qualifications of a teacher are strongly positively related to increased academic outcome of the pupils. Greenwald, Hedges, and Laine (1996) support this in their meta analysis by concluding that teachers' attributes (ability,

education, and experience), utilized as proxies for the quality of teachers, are very strongly related to pupils' academic achievement. Hanushek even puts it in the simple phrase that "teacher quality is the single most important school-based factor influencing student achievement" (Hanushek, Rivkin, & Kain, 2005).

Table 3: *Extract: Research Supporting Importance of Teacher's Quality for Pupils' Educational Achievement*

Year	Researcher	Positive Relation Between
1992	Card, Krueger, (data from 1920's and 1930's)	school inputs – earning of graduates in later life
1994	Ehrenberg, Brewer	teacher quality – students' achievement
1996	Sanders, Rivers (Tennessee)	teacher effectiveness – student achievement (especially lower achieving pupils)
1996	Ferguson, Ladd (Alabama)	teacher's test scores and education – student learning
2000	Betts, Rueben, Dannenberg (California)	teacher quality – pupils' achievement
2007	Goldhaber, Anthony	teacher quality – educational outcome (especially poor students)

The Attributes of Effective Teachers

The researchers, policymakers, basically everybody who owns a stake in the education of the children - and that should be, practically, everybody – should be concerned that the pupils have access to a good and truly qualified teacher to achieve optimal educational outcome. Therefore, a closer look at the attributes of an effective teacher has to be taken to be able to determine which attributes are desirable attributes of a teacher.

Regarding the attributes of effective teachers, a variety of research has been done, depending on the availability of data describing “teacher quality”. One somehow unsatisfactory result of all these efforts is that no consensus over teachers’ characteristics or attributes, which are associated with pupils’ increased academic outcomes, has been reached until now. So, all the surveys focus on different hypotheses and yield different, sometimes contradictory, results as to which attributes should be regarded as positively significant for pupils’ learning gains. These publications use a number of fine-grained and/ or rougher proxies and indices and examine the relationship with student outcome; an example of these parameters include teacher’s academic skills and knowledge, mastery of content, experience, certification status. Other attributes, e.g., enthusiasm or ability to convey knowledge, are not easily measureable or strongly related to other attributes typically measured in research. As the studies do not focus on an identical setup (they vary regarding the state, city, group of students, teacher attributes that are considered), they will be contemplated in chronological order.

Murnane and Phillips (1981) focus on the teaching experience of teachers and confirm that the performance, the effectiveness of teachers improves during the first several years of their teaching career, implying that a more experienced teacher is a more qualified teacher. In his article about teacher selection, Scriven (1990) proposes a framework containing qualities that an employer should scan for when hiring a new teacher. He puts emphasis on sound knowledge of subject matter, solid competence with and understanding of testing and/ or structured observation, classroom teaching ability, teaching-related intellectual and personal qualities, and worth for the school or community.

Ferguson (1991) and Fuller (1999) conducted research in Texas. They both confirm the result that, indeed, licensed teachers affect the academic outcome for students of the Texas achievement test positively and that the teacher's score on their licensing exam, their master's degree, and their experience are predictors of increased outcome in reading and mathematics of their pupils. A systematic link between student outcome and the measure of teacher's experience, teacher's post college education, and teacher's test scores is strengthened. In Ferguson's publication with Ladd (1996), these findings are validated for the measure of teacher test scores and percentage of teachers with a master's degree (supported also by Darling-Hammond and Youngs, 2002).

Monk (1994) verifies a positive relationship between a teacher's coursework in the field (and the possession of a major or minor in the subject area) and student outcome in mathematics and science for the U.S. in general, with special emphasis at the middle and high school levels. In the same year Ehrenberg and Brewer (1994)

analyze the relationship between teacher qualifications and achievement of black students. They confirm that a higher percentage of teachers who earned at least a master's degree induces higher black students' scores and that further on the increase in test scores for black students is significantly related to the index of average selectivity, the ranking in competitiveness, of the undergraduate colleges that teachers in the school attended. One other result of their research was that Hispanic students will show a decreased score level with a more experienced teacher. Hanushek and Pace (1995) add teachers' reading, vocabulary, and mathematics test scores to the attributes that influence pupils' academic outcome. A large number of research studies focuses on high school teachers that own a certification in math. The findings are somewhat consistent, that those teachers produce higher student gain in math than those who teach math and are certified in different subjects (Goldhaber & Brewer, 1997, Goldhaber & Brewer 2000, Goldhaber, Brewer, & Anderson, 2000, Harbison & Hanushek, 1992). In Texas, the teachers are required to pass a state certification exam; Ferguson (1998) finds that the math performance of pupils is positively related to a higher scoring of the teacher in this state certification exam.

Darling-Hammond (2000) finds evidence that other indices of teacher quality such as measures of academic ability, years of education, years of teaching experience (in most of the studies a teacher is regarded as an experienced teacher when he/ she has 3 or more years of teaching experience), measures of subject matter mastery, teaching knowledge, certification/ licensing status, and teaching behaviors in classroom have an influence on pupils' achievement. Additionally, she

shows that the ongoing professional development of teachers is of importance for a teaching performance that yields increase in pupils' academic achievement.

In their study of schools in California, Betts, Rueben, and Dannenberg (2000) divide schools in five levels of socioeconomic status (defined by the percentage of pupils that are eligible for free or reduced lunch). The results of this study confirm that the experience level, the education level (bachelor's degree or less), and the certification level of teachers are all linked to student achievement. Of all measurable school resources, the percentage of teachers without a full credential and the percentage of teachers with less than three years of experience are the most strongly, negatively, related variables to student outcomes (even when controlling for the high number of LEP pupils in California). The same year Goldhaber and Brewer (2000) emphasize that the type of license of a teacher is an important determinant of student outcomes.

The findings of a comprehensive study in North Carolina confirm that novice teachers are associated with lowest test scores, teachers with a degree from a less competitive college are teaching students with significantly lower test scores, and teachers with more advanced degrees teach pupils with higher test scores (slightly higher but statistically insignificant). Further, higher licensure test scores of teachers are associated with higher test scores of the students. The most consistent predictors in this research for increased academic achievement are teacher's experience and the teacher's licensure test scores (Clotfelter, Ladd, & Vigdor, 2004). In a newer publication, Clotfelter, Ladd, and Vigdor (2007) confirm for North Carolina that the experience of teachers, the licensure type, the licensure test scores, and the

NBPTS certification status are of importance for the test scores of the pupils - with larger effects for math than for reading.

A recent review of relevant research regarding the measurement of teacher quality by Peske and Haycock (2006) basically sums it up in the plain result that teacher quality matters a lot (on a statistically significant level).

Goldhaber and Anthony (2007) use data from North Carolina. They focus on NBPTS certified teachers. Their study confirms that the NBPTS certified teachers are the more effective teachers (statistically significant), with a differing grade of influence of the certification by grade level and students' characteristics. The certified teachers have an especially large impact on pupils that are receiving free or reduced lunch, both in reading and in math.

Table 4: *Extract: Teachers' Attributes that Influence Pupils' Achievement Positively*

Year	Researcher	Region	Teacher's Attributes
1981	Murnane, Phillips		• experience
1991, 1998	Ferguson	Texas	• scores in certification exam • license status • degree • experience
1994	Ehrenberg, Brewer		• masters degree • ranking of college
2000	Darling-Hammond .		• experience • certification • subject matter
2000	Betts, Rueben, Dannenberg	California	• experience • degree • certification
2004, 2007	Clotfelter, Ladd, Vigdor	North Carolina	• experience • licensure test scores • ranking of college • degree

A number of studies deny the influence of certain teachers' attributes on student achievement. Especially Eric Hanushek (1986, 1997) and Goldhaber,

Brewer, and Anderson (1999), state that the measures like holding a master's degree, certification status of the teacher, and years of teaching experience have not been shown to increase the academic output of the pupils (although, in a more contemporary research, Hanushek, Rivkin, and Kain (2005) find for Texas that teachers' performance improves during their first three to four years of teaching).

The comparison and evaluation of these publications would be even more meaningful if a nationwide definition of teacher certification procedures (guided by a federal instance of control) and of qualified teachers, existed. Currently, for example, not even the results among the 13 states that utilize the National Teacher Examination (NTE) for the certification process are comparable, because applicants may pass the exam in one state with a scoring level of 34% and in a different state with a scoring level of 51%³³. Then the results of research and the educational outcome in different states might be more comparable (bearing in mind the differences among the states) and lessons for improvement might be learnt on a nationwide basis.

The term "qualified teacher" is a combination of distinct indices of and proxies for teacher quality; it is a kind of summarizing function of the disciplinary knowledge and the knowledge of education. Some of the attributes describing a teacher are easy to determine and measure (e.g., years of experience, earning of a certain degree), some, like flexibility, creativity, adaptability, enthusiasm, and clarity of the teacher are more elusive than others are. In chapter III, an indicator function for the teacher quality will be developed (strength indicator for teaching quality), resulting in

³³ Sykes, 1990

one single number as a proxy indicator for the quality of teachers on school level – instead of an array of attributes.

The Distribution of Teacher Quality, Patterns of Teacher Sorting

The studies result in the outcomes that teachers, teachers' attributes, indeed matter. As the ultimate goal should be to close the sometimes already large achievement gap and not to widen already existing inequalities, it makes a difference how teachers with different qualifications are distributed among districts, schools, even classrooms. If teachers with weaker credentials instruct educationally more disadvantaged pupils, the effect will surely be that the achievement gap will be increased and not decreased. Therefore, it will be important to take a closer look at the distribution of the teachers, regarding their qualification levels. If sufficient data were available it would also be revealing to follow the career path of the more qualified teachers to determine in which kind of school setting they will finally pursue their teaching career (or if they quit teaching entirely).

An increasing number of researchers are focusing on the distribution of teacher quality among schools or districts, examining possible relationships between student characteristics and teacher qualifications. Those studies use a variety of attributes to describe a qualified teacher; a discussion of these attributes can be found above in "The Attributes of Effective Teachers".

Nonetheless, all these studies revolve around the relationship between the qualifications of the teacher and the characteristics of the student body, no matter how each researcher decides to describe "teacher quality" or on which low-achieving student subgroup they focus.

Research by Levinson (1988), later confirmed by Hanushek (2004), validates that the level of achievement and the socioeconomic background of the pupils are a relevant factor in a teacher's determination of career moves among schools or districts. The finding of an uneven, unequal, distribution of teachers is further supported by Ehrenberg and Brewer (1994). They determine that in counties with higher per capita income the school's teaching staff consists of a higher number of teachers with more experience and higher degrees; further, these teachers have usually graduated from a more competitive college. Among urban school districts, high poverty districts face problems in recruiting and retaining more qualified teachers (Lippman, Burns, & McArthur, 1996).

Tennessee has a long history of unequal teacher distribution. In their 1996 research, Sanders and Rivers show that in Tennessee African American pupils are almost twice as likely to be taught by the most ineffective teachers and, on the other hand, are half as likely to get the most effective teachers assigned to them. A recent publication by the Tennessee Department of Education (2007) confirms the results. Students in schools that are counted to be among high poverty or high minority schools have a lower percentage of effective teachers available than pupils in low poverty or low minority schools. This publication is even more disturbing as it shows that a larger percentage of beginning teachers in high poverty or high minority schools are among the most effective teachers (compared to low poverty or low minority schools), but that they do not tend to stay or they lose their effectiveness ("burn-out"). Among teachers with more than 6 years of teaching experience, the distribution of effective teachers among high poverty/ high minority schools and low

poverty/ low minority schools has changed. The more effective teachers are teaching at a higher percentage at low poverty or low minority schools.

Not only the quality measured in teacher's attributes seems to follow a distribution pattern across schools. Additionally, the number of teachers that had problems in other schools or districts is usually disproportionately higher in schools with a high percentage of students of low socioeconomic status or disadvantaged students (usually African-American or Hispanic children) than in other schools; those teachers seem to tend to transfer to schools where the children originate from a lower socioeconomic background (Bridges, 1996).

A more recent research for schools in Texas brought back the same results: high and medium risk districts have been displaying a measurable shortage of qualified teachers, in high-risk districts a higher percentage of inexperienced or uncertified teachers is employed than in low-risk districts (Kirby, Naftel, & Berends, 1999). Another recent research in New Jersey (Darling-Hammond, 2000) comes up with the same pattern, that less prepared teachers are primarily teaching in low-wealth city school districts. In California the findings are similar. Pupils attending high poverty schools have access to teachers with weaker qualifications than their peers have who are attending schools serving more advantaged students. Urban schools and schools with the lowest socioeconomic status sport the highest number of inexperienced teachers (defined as less than 3 years of teaching experience), the highest number of teachers who earned a bachelor's degree or less, and the highest number of teachers who are not fully certified (Betts, Reuben, & Dannenberg, 2000).

Comprehensive research done in New York by Lankford, Loeb, and Wyckoff (2002) yields disturbing, but not at all unique, findings. In New York there is no even distribution of qualified teachers across schools. In their research they find that no matter how they measure “qualification” (e.g., owning a bachelors degree or less, ranking of the college, teaching experience, certification status, passing of exams) substantially less qualified teachers instruct poor, minority pupils in urban areas. Especially non-white students, poor students, and students with limited English proficiency have less qualified teachers assigned to their classes in New York. The situation is worse in low-performing urban schools where the teacher body is of the least quality of all. The picture over the past 15 years for the variation of the distribution of qualified teachers in New York has not really changed: urban schools constantly employ less qualified teachers than suburban schools; further, they have a higher turnover rate of teachers, especially when the percentage of poor and non-white students is high.

Ingersoll’s findings in 2002, using nationwide data from the School and Staffing Survey (SASS), confirm that in schools with a student body of economically disadvantaged pupils the teachers are - slightly – more likely to own weaker qualifications than teachers in schools with a different, less socioeconomically disadvantaged, student population. Further on, the teachers of more socioeconomically disadvantaged pupils are far more likely to be assigned to teach out-of-field than those teachers who teach at schools with a less socioeconomically disadvantaged student population. Ingersoll even shows that the gap in the percentage of out-of-field assigned teachers between high and low minority schools

and between high and low poverty schools, both regarding secondary level core academic classes, increased when he analyzed the SASS of 1993/1994 and the SASS of 1999/2000.

In schools in North Carolina, the existence of teacher sorting is confirmed; the highest percentage of teachers with little experience, teachers who graduated from least competitive undergraduate institutions and teachers that have non-regular licenses is found in high poverty schools – all relative to schools in other poverty quartiles. The differences in the teacher's qualifications are sometimes large between schools with a higher or lesser percentage of socioeconomically disadvantaged pupils. On the other hand, more experienced teachers, teachers having acquired their degree at a more competitive college or owning an advanced degree instruct at schools with a more affluent and higher achieving population with a higher fraction of whiter residents (Clotfelter, Ladd, & Vigdor, 2004, Clotfelter & Ladd, 2006, Clotfelter, Ladd, Vigdor, & Wheeler, 2006). The socioeconomic status of the pupil is the strongest predictor of sorting across classrooms. Not surprisingly, this sorting can even be found when sorting within a school is surveyed.

A recent study by Peske and Haycock (2006) results in the unsurprising finding that poor and minority children have access to less qualified teachers, that large differences between teacher qualification are prevalent, especially in the scrutinized areas in Ohio, represented by Cleveland, Illinois represented by Chicago, and Wisconsin represented by Milwaukee. The national distribution pattern for teachers (focusing on students of color, low-income students, and low-achieving students of all races) proves to be the same: in high-poverty, high minority

secondary schools, more classes are taught by out-of-field teachers; that is by teachers lacking a college major or minor in the field they are currently assigned to, than in more affluent schools.

Scrutinizing data from North Carolina regarding the certification status of the teaching body, Goldhaber and Anthony (2007) confirm that the NBPTS certified teachers are found in the more affluent schools districts, in schools that are higher performing in state tests, and in schools that have a lower number of disadvantaged pupils.

The following table (table 4: Extract: Research Confirming Teacher Sorting) sums up some of the available research that concluded, that, indeed, sorting of teachers exists in a way that high poverty or high minority schools have access to less qualified, less effective teachers in comparison to low poverty or low minority schools.

Table 5: *Extract: Research Confirming Teacher Sorting*

Year	Author	Surveyed Area/ Region
1996	Sanders, Rivers	Tennessee
1996	Lippman, Burns, McArthur	Urban school districts
1999	Kirby, Naftel, Berends	Texas
2000	Darling-Hammond	New Jersey
2000	Betts, Reuben, Dannenberg	California
2002	Lankford, Loeb, Wyckoff	New York
2004	Clotfelter, Ladd, Vigdor	North Carolina
2006	Clotfelter, Ladd	North Carolina
2006	Peske, Haycock	Cleveland (Ohio), Chicago (Illinois), Milwaukee (Wisconsin)
2007	Goldhaber, Anthony	North Carolina
2007	Tennessee Department of Education	Tennessee

The time span that is covered by these – selected - studies ranges from back in the 1990s to the present. The sum of these findings that result in basically the same distribution patterns of qualified teachers, in states with obviously distinct student bodies and the fact that, even over larger time periods, these findings are similar is very disturbing. Obviously there exists a group of students (African American children, urban children, children with a low socioeconomic background, minority children, children in high poverty schools) who are assigned to less qualified

teaching personnel. Those pupils are more likely to be the pupils that are already scoring at the lower achieving end of the spectrum and, further on, we have proof that more qualified teachers are responsible for a greater student achievement. Therefore this finding indicates that the current teacher distribution might generate an undesired increase in the achievement gap and not support the desired decrease in disparities in academic outcomes across different groups of children.

The Sources of Inadequacies and Inequities in Teacher Qualifications

The question as to why the inequalities in the distribution of more qualified teachers exist, and even seem to become more pronounced over time, may be answered in two different ways. The first possible answer is that schools are tailoring their spending, their hiring policies, towards the needs of their distinctive student body. They may, for example, put more emphasis on other budget items than on hiring more expensive teachers (teachers with more experience, a higher degree etc.). Sadly, the available research data do not support this explanation (Ballou & Podgursky, 1997). Rather, research evidence seems to support the second answer: that there are schools/ districts that have less measurable school resources available than others and that those schools generally fit the description of being high poverty, high minority, low achieving schools.

One variable, the teacher's salary, was scrutinized concerning the employment decision a teacher makes during his/ her career. The findings were not surprising. The labor market for teachers works like almost every other labor market: the wages determine the movement of the employees. General research done by Baugh and Stone (1982) and Hanushek and Pace (1995) support that teachers

chose where to teach due to income considerations. Haberman (1995) confirms that a poorly managed hiring process and the preference of employing lower salaried teachers is contributing to the uneven distribution of qualified teachers. Brewer's research (1996) for schools in New York concludes that higher salaries and job opportunities in administration are responsible for the teacher's career decisions. Murnane and Olsen (1989) show in their research regarding teachers in Michigan that, indeed, the length of time a teacher stays in the teaching profession is correlated to the paid salary.

The political pressure that parents and other local residents exert makes a difference in the level of teachers' qualification in schools. More affluent communities are able to apply more demands. The power of complaining parents is confirmed to be strong enough to influence the transfer of the teacher to another school – likely a school with high student transfer rates, high numbers of students receiving free/reduced lunch, and a high percentage of minority students (Bridges, 1996). Another reason to move to a different school/ district is that teachers obviously prefer to be employed at a school with high socioeconomic status (Lankford, 1999, for New York City and Hanushek, Kain, and Rivkin, 1999, for Texas). Further on, in times of possible sanctions, due to the NCLB act, for schools that do not achieve adequate yearly progress (AYP) a teacher, especially a high-qualified teacher, will avoid teaching at a school/ district that does not meet the AYP standards.

Ingersoll (2002) differentiates between the “teacher deficit perspective” and “organizational perspective”; the first view focuses on inadequate teacher supply and training, the second on hiring and staffing practices that may lead to an

unnecessarily high number of less qualified, or out-of-field, teachers hired by a school for non-scientific reasons. Even without a shortage of high-qualified teachers, less advantaged schools can end up hiring less qualified teachers because they are less expensive staff.

A different reason for the unequal distribution of qualified teachers may be based in reasons related to hiring and staff assignment policies of a school/ district. Teacher unions and their work rules, aspects of seniority, the general hiring processes of a district/ school may result in not attracting more qualified teaching staff. In addition, as mentioned in chapter I, districts in the same state, districts that are geographically close to each other, may have very distinctive sets of rules in their collective bargaining agreements regarding the hiring process. The Detroit Public Schools embrace in their collective bargaining agreement the balanced staff concept when hiring teachers *“In order to implement the balanced staff concept: In filling vacancies and/or when a school's staff is increased or decreased, appropriate assignments or transfers will be made .. giving priority to the balanced staff concept elements in the following order: necessary qualifications to teach such area and grade level, race, experience, and sex”*³⁴. On the other hand, the geographically close by school district of Grosse Point Public Schools emphasizes that *“to the extent possible, only teachers who possess the highest qualifications, as determined by the Board, shall be given consideration for employment .. [and] .. preference in the employment of new teachers shall be given to those candidates with successful*

³⁴ Retrieved January 21st 2009 from http://www.mackinac.org/archives/epi/contracts/82010_2005-06-30_AFL-CIO_E_X.PDF

professional experience related to the assignment. ³⁵. The influence of the specific collective bargaining agreement of a distinctive district may therefore well be responsible for initiating certain sorting patterns among the teaching staff. Additionally, the collective bargaining agreements of most of the districts typically provide the first right of transfer to other schools, that offer vacancies, to more senior teachers, more experienced teachers. For the most highly qualified teachers, a gradual migration from least advantaged to most advantaged schools within districts is made possible by making use of the seniority rules in the collective bargaining agreements.

³⁵ Retrieved March 3rd 2009 from http://www.mackinac.org/archives/epi/contracts/82055_2009-08-31_GPEA_MEA_E_X.PDF

CHAPTER III: METHODS

The parameters considered are the schools, respectively the districts, the teaching faculty, and the student body. All of these parameters will be described as owning a certain number and characteristic of attributes.

The Schools

In the Detroit Metropolitan area, a relatively large number of charter schools (also identified as public school academies) is present³⁶; about ten percent of all the schools are charter schools. The charter schools and the traditional public schools (respectively the public school districts) are individually identified, so that each school type can be examined independently. Further on, the schools are described as being an elementary or middle school (as the available data sets do not provide reliable data for high schools, this study will be limited to elementary and middle schools, but still containing 800 schools).

The observed unit will be a school, a district and/ or a county. During the analysis, some districts may show unexpected peculiarities in their teacher distribution in context to the student body. These districts will be examined separately, e.g., on a school basis. Further on, the largest public school district, the Detroit Public Schools, with an enrollment of 107,874 students in 2008, will be scrutinized as an example of a large urban, high minority, economically disadvantaged, school district (in the year 2008 there were 89.1% African-American

³⁶ 130 charter schools/ public school academies, 1245 public schools, and 83 public school districts for the year 2006, retrieved from schooldatadirect.org, October, 5th, 2008

pupils and 73.9% economically disadvantaged pupils enrolled in the Detroit Public Schools)³⁷.

The District Level

Three utilized parameters on the district level will be the

- Average residential wealth per pupil, AVG_HSEV, for traditional public schools (charter schools – or public school academies – are legally designated school districts but, because they have no property tax base, have a zero value for this variable)
- Average total instructional expenditures per pupil, AVG_ITOT
- Average starting teacher salary in the unit, starting.teacher.salary, and the average salary for teachers who obtained a master's degree and have 10 years of teaching experience, salary.10year.teacher.w.master

The here utilized data file contains observations for 167 districts.

The Teaching Faculty

This study follows the research that defined the classification of teachers as more or less qualified by describing a number of attributes (e.g., experience, possession of a certain degree, quality of undergraduate institution), ascribed to teachers as proxies for the quality of a teacher. Other studies use the methodology to focus on the added value of a teacher, measured by the growth of the pupils in the teacher's classroom, and define a qualified teacher as a teacher who attains an

³⁷ Data retrieved June, 9th, 2009, from

<http://www.schooldatairect.org/app/location/q/stdid=23/lid=116/stllid=207/locid=981907/stype=/catid=-1/secid=-1/compid=-1/site=pes>

above average increase of academic achievement of the students. This value-added approach requires that reliable data on the individual teacher level and on the individual classroom level are existent. The data must further allow that teachers be matched with their students. The currently available databases for Michigan do not yet provide for this.

The data about individual school employees in the State of Michigan are provided through two different sources, namely the Register of Professional Personnel (REP) and the Personnel Licensing System (L2K). These data sets, made available by the Michigan Department of Education and the Michigan Center for Educational Performance and Information, contain records on all public school employees in the Detroit Metropolitan area (consisting of the three counties Macomb, Oakland, and Wayne), in sum 26,135 teachers. Active classroom teachers were identified by screening the REP and L2K records two ways: first, all personnel working in Michigan public schools during the 2005-2006 academic year, the most recent for which data are available, who held any of the five teaching certificates or four teaching permits issued by the state were selected. Second, because many administrators and support staff (e.g., psychologists, counselors, etc.) hold teaching credentials but do not teach, those personnel whose salary and benefits were recorded with “instruction” accounting codes were identified as classroom teachers.

The data set compiled for this study contains data on the school level regarding the proxies for teachers’ quality, so that for each of the schools, respectively districts, (or other units) the data for the teaching faculty can be calculated using the cumulative data for each unit. The data gathered by the REP

contains, among others, the place of employment of a teacher (e.g., school, district, or intermediate district), date of hire and termination, undergraduate institution, highest degree, major, minor, subject teaching assignment, status regarding the “highly qualified” clause of NCLB, and type of professional license. Additionally, the State of Michigan compiles the teachers’ license or certification credential via the L2K. The State of Michigan provides a crosswalk at the individual teacher level between the REP and L2K data systems.

The attributes used in this study³⁸ to explore the composition of the teaching staff will be the

- Years of teaching experience

Prior research generally differentiates between “below three years” of teaching experience and “three years and above” of teaching experience. According to this differentiation, the available data set provides the percentage of teachers with less than 3 years of teaching experience (PCTNEWTEACHER).

- Certification/ license status

The certification/ licensure of Michigan’s teachers offers a wide range of permits and certificates (the Personnel Licensing System reports up to 47 different classifications). In this study the teachers are identified by utilizing the current valid major classification categories, which are: owning a permit, a provisional certificate, or a professional certificate in the subject

³⁸ Prior research has shown the significance of two additional attributes of teachers, teacher’s test scores in exams and amount of coursework taken. These attributes might be included when exploring the composition of the teaching staff, but the data are not available at this time.

area³⁹; no other distinctions, e.g., among permits, will be made. Additionally, those teachers who hold a permanent license will be treated as if they own a professional certificate (the permanent license represents the highest possible license type a teacher could acquire under the predecessor of today's licensing system; the certification status for a teacher as permanent licensed is grandfathered under the current system). The percentage of teachers holding a permanent, professional, or provisional license is represented by PTCERT and the percentage of teachers who have a substitute permit is represented by PCTSUB

- Quality of teachers' education

The quality of the teacher's education is measured by classifying the undergraduate institution the teacher attended, according to Barron's College Admission Selector⁴⁰. The college is ranked by its competitiveness, aggregated to two categories: competitive (categories 1 through 5 in Barron's ranking) and uncompetitive (categories 6 through 9). For each school, the percentage of teachers who graduated from a competitive college is available in PCTCOMPCOLL.

³⁹ Definition of the utilized certificates/ permits see Appendix A: Teacher Certification System in Michigan

⁴⁰ Barron's College Admissions Selector reports nine categories, they are frequently aggregated to a smaller number of categories

- Possession of a major/ minor in subject area

The classification is made depending on whether the teacher owns a major or a minor in the subject area he/ she teaches, the total numbers for each school are represented by Certified.Minor and Certified.Major, PCTMAJ_MIN represents the percentage of certified teachers in a school.

- Turnover rates of teachers

The percentage of teachers who left the school in the 2005-2006 school year is available in PCTSEPARATEDTEACHER. A high turnover rate is generally regarded as more undesirable than a lower turnover rate as a high turnover rate indicates a lesser school climate and quality .

Strength Indicator for Teacher Quality

The strength indicator SI_{TQ} for “teacher quality” is a function, an indicator, for cumulative teacher quality attributes. A number of n teacher attributes can be combined in this indicator; each of these attributes will be represented by a number between 0 and 1 (0 will indicate the lowest possible parameter value, 1 the highest possible parameter value). Therefore, for n attributes, the strength indicator, calculated as the sum of the numbers of all of the individual attributes, will be a number between 0 and n . Then the function for the n attributes is $SI_{TQ} = f(x_1, x_2, \dots, x_{n-1}, x_n)$, with $x_i \in [0; 1]$,

or $SI_{TQ} = a_1 * x_1 + a_2 * x_2 + \dots + a_{n-1} * x_{n-1} + a_n * x_n$

The a_i represent a set of weights where each a_i ($i=1, \dots, n$) represents a weight, standing for a number between 0 (no weight assigned to the x_i

measurement) and 1 (highest possible weight assigned to the x_i measurement), with

$$a_i \in [0; 1] , \text{ alternatively, for a number of } n \text{ attributes, } SI_{TQ} = \sum_{i=1}^n a_i * x_i .$$

Therefore, for the teaching faculty at each school the indicator SI_{TQ} represents a cumulative strength number, an indicator, that will be 0 for a teaching staff without any of the desired n attributes and that will be n for a teaching staff where every teacher owns any and every of the desired n attributes we use as a proxy for teacher quality at its highest possible value. The strength indicator has the characteristics of an ordinal variable as it provides ranking beside classification. The explanatory power of the strength indicator will then be tested (with all a_i set at 1). Depending on the results of these tests, further analyses with the strength indicator may be done.

In this study, n is represented by five attributes: years of experience, certification status, competitiveness of the undergraduate institution, possession of a minor/ major in the subject area, and the percentage of teachers leaving the unit (the teacher's test scores in exams and the amount of coursework taken could be added in a follow-up study if the data were available). Therefore, the indicator for each school will be a number between 0 and 5, with 0 representing a least qualified teaching staff, 5 representing a most qualified teaching staff, the ideal teaching staff according to the five tested attributes.

The assignment of the values to the attributes will be done utilizing the individual averages of the five attributes and the individual standard deviations; all five attributes will be defined as three category variables. The standard deviation for

the variables is quite high; therefore, the values will be divided by two (or three) for the assignment of the variables.

The assignment of the values to variables representing the attributes:

x_1 , years of experience, PCTNEWTEACHER, with

$x_1 = 0$ if the percentage of teachers is between 100% and the average plus half the standard deviation

$x_1 = 0.5$ if the percentage of teachers is between the average plus half the standard deviation and the average minus half the standard deviation

$x_1 = 1$ if the percentage of teachers is between the average minus half the standard deviation and 0 %

x_2 , certification status, PCTCERT, x_3 , competitiveness of the undergraduate institution, PCTCOMPCOLL, x_4 , possession of a major/ minor in the subject area, PCTMAJ_MIN, each x_i ($i = 2,3,4$) with

$x_i = 0$ if the percentage of teachers is between 0% and the average minus half the standard deviation

$x_i = 0.5$ if the percentage of teachers is between the average minus half the standard deviation and the average plus half the standard deviation

$x_i = 1$ if the percentage of teachers is between the average plus half the standard deviation and 100 %

x_5 , percentage of teachers leaving the unit in 2005-2006, PCTSEPARATEDTEACHERS, with

$x_5 = 0$ if the percentage of teachers is between the average plus a third of the standard deviation and 100 %

$x_5 = 0.5$ if the percentage of teachers is between the average plus a third of the standard deviation and the average minus a third of the standard deviation

$x_5 = 1$ if the percentage of teachers is between 0% and the average minus a third of the standard deviation

In this study the function for the five attributes will then be

$$SI_{TQ} = f(x_1, x_2, x_3, x_4, x_5) \text{ or } SI_{TQ} = a_1 * x_1 + a_2 * x_2 + a_3 * x_3 + a_4 * x_4 + a_5 * x_5$$

with $x_i \in [0; 1]$ and, generally, $a_i \in [0; 1]$; for testing purposes the a_i will here all be set at 1, indicating an equal weight for each of the five attributes. Using this function, the teaching faculty of each school can be represented by one number, an image on an ordinal scale, standing for the cumulative strength of the four attributes used to describe a qualified teacher. The way the attribution of values to the five variables is done, the possible values for SI_{TQ} are between 0 and 5 in steps of 0.5.

The Student Body

The student body for each analyzed unit (e.g., school, district) will be clustered according to the following attributes⁴¹

- Fraction of students receiving free/ reduced-price lunch

The percentage of pupils that are eligible for free or reduced lunch, PCTFREEREDL, is used as a proxy for student poverty.

- Standardized test scores

The data set regarding the pupils' achievement, the Michigan Educational Assessment Program (MEAP) data file, is made available by the Michigan Department of Education. It provides student test scores for the year 2005-2006; data files are available at the student, school, district, intermediate school district, and state level. The data file provides the scores at grades 4 and 7 in English Language Arts and Mathematics. The pupils' test scores are grouped into four levels⁴²; in this research the student body is split, achievement-wise, in two categories, according to their MEAP results: those pupils that demonstrate proficiency (levels 1 and 2) and those pupils that do not demonstrate proficiency (levels 3 and 4). Schools can then be classified by the fraction of students that demonstrate proficiency, represented by

⁴¹ An additional significant attribute would be "fraction of minority students". Due to the composition of the student body in the Detroit Metropolitan region (the percentage of Hispanic pupils is low, ranging between 1.9% and 4.8%, according to data retrieved from schooldatadirect.org, February, 5th, 2009), the classification of schools in regard to minorities would be made according to the percentage of African-American pupils in the student population. The current data set does not provide the necessary information to include this attribute.

⁴² Level 1 stands for advanced performance, level 2 for proficient, level 3 for partially proficient, and level 4 for not proficient.

PercentProficient.ELA.GR4, PercentProficient.ELA.GR7, PercentProficient.MATH.GR4, and PercentProficient.MATH.GR7

Descriptive Statistics

Simple tables presenting descriptive statistics like mean, standard deviation, minimum, and maximum of a number of variables (e.g., percentage of teachers with less than three years of teaching experience, fraction of students receiving free or reduced lunch) for the Detroit Metropolitan region, the counties of Wayne, Oakland, and Macomb, and the Detroit Public Schools are provided at the beginning of the next chapter. Tables regarding the distribution of teachers with the desired attributes (percentage of teachers that own a certain attribute, e.g., teaching experience of three years or more), respectively of schools who show a high strength indicator, across the poverty quartiles of schools, and across the MEAP score categories will be established⁴³. These tables are calculated separately for traditional public schools and charter schools. The areas where the most qualified teachers are teaching and the areas where the least qualified teachers are teaching will then be identified and further scrutinized, while focusing on the different attributes of the student body (e.g., percentage of economically disadvantaged pupils, MEAP scores).

A nonrandom distribution of teachers among the schools is expected. The assumption is that the more qualified teachers will be likely to teach in units that show a lower than average percentage of economically disadvantaged pupils and higher than average MEAP scores. Further on, when making the distinction between

⁴³ Q 1, quartile 1, will represent the highest poverty level or the lowest average MEAP score

charter schools and traditional public schools, the more qualified teachers are expected to leave charter schools and move on to work in a traditional public school.

Analytical Statistics

The strength of the relationship between attributes of teachers and the student body/ the school will be calculated for each county, differentiated in charter schools and traditional public schools (and optionally for single districts/ schools), using the Pearson correlation coefficient r . The square of the coefficient, the coefficient of determination, mirrors the amount of explained variance for the correlation. The relations that will be analyzed will be between units distinguished by the percentage of economically disadvantaged pupils or the percentage of pupils that demonstrate proficiency in the MEAP test, and the teachers' attributes, particularly years of teaching experience, certification status, college ranking, and possession of a minor/ major in subject area. The Pearson correlation coefficient matrices will be calculated for the Detroit Metropolitan region, the counties of Wayne, Oakland, and Macomb, and the Detroit Public Schools.

The assumption is that the more disadvantaged units, units with a higher percentage of economically disadvantaged pupils or a lower percentage of pupils that demonstrate proficiency in the MEAP test, have less access to more qualified teachers, measured by all utilized attributes. The correlation coefficient, respectively the coefficient of determination, is expected to be large between the set of teachers with higher characteristics of the desired attributes and less disadvantaged units.

Then, the analysis of variance (ANOVA) is done to determine whether the variance in the distributions of the teacher quality proxies (particularly regarding the

years of experience, certification status, college ranking, and possession of a minor/major in subject area) across counties (or districts, schools) is statistically significant. This is done by testing the means of the respective teacher quality proxy variable levels while considering the distinction of the schools by the percentage of economically disadvantaged pupils or the percentage of pupils that demonstrate proficiency in the MEAP test. The assumptions are that there are, indeed, at any rate some statistically significant differences, which are, again, favoring the more affluent units.

Predictive Statistics

On the school level, one regression is developed, predicting one dependent variable, the criterion, by a number of independent variables, the predictors. Attributes of student characteristics and school resources operate as the predictors. Student characteristics will be represented by the percentage of economically disadvantaged students and the average MEAP test score; school resources are, e.g., total per pupil instructional expenditures or household wealth per pupil. The linear regression model is generally represented by the formula $Y = b * X + a$, where X represents the independent variable (respectively a vector of variables), Y represents the dependent variable, a the intercept with the Y -axis (the regression constant), and b the slope, the departure from the horizontal (the regression coefficient or a vector of regression coefficients). The pre-requirement for the utilization of the regression model is an approximately normal distribution of the variables, which should be the case for the here utilized attributes. The results of the prediction by the regression are obviously more accurate, and the standard error of

estimate is smaller, when the correlation between the predictor(s) and the criterion is larger.

The quality of the teaching staff will be determined in dependence of the teacher's salary (starting.teacher.salary and salary.10year.teacher.w.master), the average residential wealth of the district, AVG_HSEV, the average instructional expenditure per pupil, AVG_ITOT, the percentage of pupils receiving free or reduced lunch, PCTFREEREDL, and the county (Macomb, Oakland, Wayne).

$TQ = f(\text{student characteristics, school resources, county})$

or

$TQ = f(\text{salary, residential wealth, percentage of free or reduced lunch, county})$

In the regression model, one independent variable, one predictor, will be the county. The three values for this independent variable will be "Oakland", "Macomb", and "Wayne". As multiple regression requires a set of independent variables that are metric variables (quantitative data, interval or ratio data) to predict or explain a dependent variable (criterion), these non-metric values for the county variable have to be transformed to metric variables (quantitative data). The dummy coding technique will be employed to execute this transformation. The dummy variable is a binary metric variable used to represent a single category of a non-metric variable. In this way, dummy coding provides a method to transform non-metric variables (qualitative, nominal or ordinal) into metric variables by utilizing, generally, "0" and "1" for coding. Therefore, the number of coded vectors used for qualitative predictor variables is equal to the number of categories of the variable minus one.

In our case, the county variable contains three categories, consequently the coding will be done as follows:

	X_1	X_2
Oakland	0	0
Macomb	0	1
Wayne	1	0

by utilizing X_1 and X_2 as the two dummy variables and “Oakland” as the omitted category. The variables X_1 and X_2 can then be used in the multiple regression analysis, as they are quantitative, metric, variables. Oakland is hereby represented by the base results, while Wayne is represented by X_1 and Macomb is represented by X_2 .

The assumed result of the regression model is that the student characteristics, represented by low percentage of economically disadvantaged pupils and high percentage of pupils that demonstrate proficiency in the MEAP test, and the school resources, represented by, e.g., high total per pupil instructional expenditures and high household wealth per pupil, are indeed predicting a more qualified teaching staff, therefore providing evidence of non-random sorting of teaching quality.

Overview: Statistical Analysis

The following table lists the hypotheses drafted in chapter I and notes the variables and the used analytical method.

Table 6: *Statistical Analysis*

Hypothesis	Variables	Statistical Method
H1: Teacher quality is not randomly distributed in the Detroit Metropolitan region.	<p>Dependent Variable: Teacher Quality, measured by proxies (represented by the mean percentage per school) and the strength indicator</p> <p>Independent Variables: Percentage of low-income pupils, MEAP scores</p>	<p>All schools/ districts in the Detroit Metropolitan area are included. Analysis of variance will be used to determine if there is a statistically significant difference in the means for the tested proxies of teacher quality across the poverty quartiles and the two MEAP categories.</p>

Hypothesis	Variables	Statistical Method
H2: Urban schools have lesser-qualified teachers.	<p>Dependent Variable: Teacher Quality, measured by proxies (represented by the mean percentage per school) and the strength indicator</p> <p>Independent Variable: Category of the school, represented by the Detroit Public Schools</p>	<p>The schools in the Detroit Metropolitan area will be utilized; analysis of variance will be used to determine if there is a statistically significant difference in the means for the tested proxies of teacher quality.</p>
H3: Charter schools have a different teacher body characteristic than comparable traditional public schools (qualified teachers tend to leave charter schools, less qualified teachers tend to stay).	<p>Dependent Variable: Teacher Quality, measured by proxies (represented by the mean percentage per school) and the strength indicator</p> <p>Independent Variable: Category of school (charter school, traditional public schools)</p>	<p>All the schools in the Detroit Metropolitan area will be differentiated in charter schools and traditional public schools; analysis of variance will be used to determine if there is a statistically significant difference in the means for the tested proxies of teacher quality.</p>

Hypothesis	Variables	Statistical Method
H4: The teacher quality is depending on school resources, pupil's characteristics and their test scores; the more school resources are available, the lower the number of economically disadvantaged pupils is, and the higher the students' test scores are, the better the teachers are to be expected.	Dependent Variable: Teacher Quality Independent Variable: School resources, student characteristics, student achievement and the county	All schools/ districts in the Detroit Metropolitan area are included. A regression model will be used to determine the dependency of the teacher quality from the independent variables. The model will be estimated by the method of weighted least squares (WLS) with each observation (school) weighted by the square root of the number of teachers ⁴⁴ .

⁴⁴ Weighted least squares is an appropriate estimation technique when one suspects that the error terms are not of equal variance for each observation (heteroskedasticity). The most common instance of heteroskedasticity is with aggregate data, such as the school-level data examined here, where the dependent variable is a mean value for the individuals in the observational unit. The accuracy of the dependent variable will be a function of the number of individuals in the aggregate. That is, observations for the more populous units (e.g., schools) are presumably more accurate and should exhibit less variation about the true value than data drawn from smaller schools. This leads to different values of the error term variance for each observation, the heteroskedastic problem. For discussions see, for example, Eric Hanushek and John Jackson, *Statistical Methods for Social Scientists*, San Diego, CA: Academic Press, 1977, 142-153.

CHAPTER IV: RESULTS OF DATA ANALYSES

The analyses of the data set will follow the approach outlined in chapter III, starting with descriptive statistics, followed by analytical statistics, and, finally, by predictive statistics. Excel 2003 was utilized to calculate the tables and values regarding the descriptive statistics, working with the numbers in percentage. The percentiles for the teachers' attributes and the pupils' attributes (test scores and eligibility for free or reduced lunch) and the analytical and predictive statistics were calculated in SPSS 17, working with the numbers in percentage.

The available data set does not provide the values for the variables `starting.teacher.salary` and `salary.10year.teacher.w.master` for charter schools in Wayne. The utilized imputation method for the variable `starting.teacher.salary` for those schools is to substitute the missing values by 90% of the average teacher salary of the individual charter schools; this substitution provides a good enough approximate value for the purpose of this research. The other missing variable, `salary.10year.teacher.w.master`, can not be meaningfully substituted for the charter schools in Wayne.

Descriptive Statistics, Conclusions

The following tables, tables 7 through 12, will present the minimum, maximum, mean, and standard deviations for data attributes (e.g., the percentage of teachers with less than 3 years of teaching experience) for different areas, like the whole Detroit Metropolitan area⁴⁵ (DetroitMA), the counties of Macomb, Oakland,

⁴⁵ The Detroit Metropolitan Area consists of the counties of Macomb, Oakland, and Wayne.

and Wayne, and the Detroit Public Schools ⁴⁶ (DPS), differentiated in traditional public schools (PS) and charter schools (CS). With the exception of the number of charter schools in Macomb and Oakland, the number of schools (respectively valid observations) utilized to calculate the different values is large (between 56 and 414). The numbers of valid observations for charter schools in Macomb and Oakland are lower, between 3 and 14 (depending on the variable), so the results are not as reliable as the results are when larger numbers of valid observations are used. The last table, table 13, reports the percentage of pupils being eligible for free or reduced lunch across the area.

⁴⁶ The Detroit City School District is located in the county of Wayne.

Table 7: *Percentage of Teachers with less than 3 Years of Teaching Experience (PCTNEWTEACHER)*

Area (number of schools: all/ PS/ CS)	Number of teachers			PCTNEWTEACHER											
	All	PS	CS	Maximum			Minimum			Average			standard deviation		
				All	PS	CS	All	PS	CS	All	PS	CS	All	PS	CS
Macomb (155/149/6)	5018	4784	234	95	60.71	95	0	0	15.79	24.08	22.66	59.44	13.78	10.63	30.70
Oakland (220/206/14)	7834	7225	609	100	100	92.31	0	0	10.71	18.51	16.47	48.62	16.38	13.52	24.31
Wayne (414/354/60)	13283	11162	2121	100	100	100	0	0	0	14.27	9.93	39.82	18.19	13.11	22.61
DPS (147/147/-)	4775	4775		50	50		0	0		5.17	5.17		7.30	7.30	
DetroitMA (789/709/80)	26135	23171	2964	100	100	100	0	0	0	17.38	14.51	42.83	17.30	13.71	23.93

Table 8: *Percentage of Teachers Leaving the Unit in 2005-2006 (PCTSEPARATEDTEACHERS)*

Area (number of schools: all/ PS/ CS)	Number of teachers			PCTSEPARATEDTEACHERS											
	All	PS	CS	Maximum			Minimum			Average			standard deviation		
				All	PS	CS	All	PS	CS	All	PS	CS	All	PS	CS
Macomb (155/149/6)	5018	4784	234	19.42	18.52	19.42	0	0	0	4.54	4.45	6.58	4.57	4.40	7.99
Oakland (220/206/14)	7834	7225	609	50	50	25.58	0	0	0	4.65	4.02	14	5.81	5.11	7.52
Wayne (414/354/60)	13283	11162	2121	100	100	80	0	0	0	6.46	5.49	12.18	9.38	8.16	13.34
DPS (147/147/-)	4775	4775		100	100		0	0		8.19	8.19		11.03	11.03	
DetroitMA (789/709/80)	26135	23171	2964	100	100	80	0	0	0	5.58	4.84	12.08	7.77	6.73	12.22

Table 9: *Percentage of Teachers Graduating from a Competitive College (PCTCOMPCOLL)*

Area (number of schools: all/ PS/ CS)	Number of teachers			PCTCOMPCOLL											
	All	PS	CS	Maximum			Minimum			Average			standard deviation		
				All	PS	CS	All	PS	CS	All	PS	CS	All	PS	CS
Macomb (151/145/6)	5018	4784	234	20.00	20.00	13.64	0	0	0	4.29	4.18	6.71	4.58	4.53	5.43
Oakland (218/204/14)	7834	7225	609	53.85	52.38	53.85	0	0	2.33	11.73	11.42	16.23	10.73	10.35	15.04
Wayne (404/345/59)	13283	11162	2121	45.45	42.11	45.45	0	0	0	10.08	9.44	13.87	9.81	9.45	11.05
DPS (147/142/-)	4775	4775		38.46	38.46		0	0		3.95	3.95		5.12	5.12	
DetroitMA (773/694/79)	26135	23171	2964	53.85	52.38	53.85	0	0	0	9.42	8.92	13.75	9.67	9.31	11.63

Table 10: *Percentage of Teachers Owning a Major or Minor in Subject Area (PCTMAJ_MIN)*

Area (number of schools: all/ PS/ CS)	Number of teachers			PCTMAJ_MIN											
	All	PS	CS	Maximum			Minimum			Average			standard deviation		
				All	PS	CS	All	PS	CS	All	PS	CS	All	PS	CS
Macomb (156/150/6)	5018	4784	234	50.00	17.39	50.00	0	0	4.76	3.74	3.03	21.57	6.10	3.80	18.09
Oakland (221/207/14)	7834	7225	609	61.54	55.56	61.54	0	0	3.57	8.59	7.48	25.03	10.24	8.92	14.21
Wayne (414/354/60)	13283	11162	2121	100	100	80.00	0	0	0.00	14.87	13.58	22.48	18.11	18.26	15.23
DPS (147/147/-)	4775	4775		100	100		0	0		24.57	24.57		19.57	19.57	
DetroitMA (791/711/80)	26135	23171	2964	100	100	80.00	0	0	0	10.92	9.58	22.86	15.09	14.50	15.11

Table 11: *Percentage of Teachers Holding a Permanent, Professional, or Provisional License (PCTCERT)*

Area (number of schools: all/ PS/ CS)	Number of teachers			PCTCERT											
				Maximum			Minimum			Average			standard deviation		
	All	PS	CS	All	PS	CS	All	PS	CS	All	PS	CS	All	PS	CS
Macomb (152/146/6)	5018	4784	234	100	100	89.47	0	0	40	69.16	69.58	58.95	14.79	14.49	19.49
Oakland (218/204/14)	7834	7225	609	100	100	76.92	32.84	32.84	40	65.84	66.19	60.64	12.53	12.41	13.60
Wayne (412/352/60)	13283	11162	2121	100	100	93.33	0	0	0	62.55	63.74	55.54	15.48	14.65	18.32
DPS (147/145/-)	4775	4775		100	100		0	0		59.20	59.20		13.91	13.91	
DetroitMA (782/702/80)	26135	23171	2964	100	100	93.33	0	0	0	64.75	65.67	56.69	14.79	14.16	17.59

Table 12: *Percentage of Teachers Holding a Substitute Permit (PCTSUB)*

Area (number of schools: all/ PS/ CS)	Number of teachers			PCTSUB											
				Maximum			Minimum			Average			standard deviation		
	All	PS	CS	All	PS	CS	All	PS	CS	All	PS	CS	All	PS	CS
Macomb (152/149/3)	5018	4784	234	83.33	41.67	83.33	0	0	28.57	14.15	13.38	52.21	10.75	8.79	28.14
Oakland (216/205/11)	7834	7225	609	86.67	71.43	86.67	0	0	20.78	12.59	10.84	45.25	12.68	9.52	19.34
Wayne (410/354/56)	13283	11162	2121	100	100	100	0	0	0	14.15	8.90	47.34	18.54	9.42	26.22
DPS (147/147/-)	4775	4775		66.67	66.67		0	0		7.63	7.63		7.50	7.50	
DetroitMA (778/708/70)	26135	23171	2964	100	100	100	0	0	0	13.72	10.40	47.22	15.76	9.47	25.04

The percentage of teachers with less than three years of teaching experience (PCTNEWTEACHER, table 7) shows the employment of proportionally fewer inexperienced teachers for the Detroit Public Schools (DPS, N=147), mirrored by the low maximum for PCTNEWTEACHER with 50%, and the low average of 5.17%; the small standard deviation of 7.30 supports a homogeneous distribution. On the other hand the charter schools in Macomb demonstrate a high minimum of inexperienced teachers with 15.79% and a huge standard deviation of 30.70, indicating a very uneven picture. But, as the number of valid observations for charter schools in Macomb is by far the lowest with only 6, this result has to be regarded carefully.

Table 8 represents the percentage of teachers who left their teaching unit during the school year 2005-2006 (PCTSEPARATEDTEACHERS). The percentage is extremely low for Macomb, with a low maximum of 19.42% for all schools (N=155), 18.52% for traditional public schools (N=149), and 19.42% for charter schools (N=6), indicating a tendency for teachers to stay in their schools in Macomb in general. Again, the valid number of observations for charter schools in Macomb is only 6, so the results for charter schools in Macomb are not highly reliable. Charter schools in Oakland (N=14) display the highest average percentage of teachers leaving the unit with 14.00%, public schools in Oakland (N=206) demonstrate the lowest average percentage of quitting teachers with 4.02%. One traditional public school (Gardner Elementary School, Detroit Public Schools, Wayne County), reports 100% of teachers leaving the unit in the school year 2005-2006. In general, this is likely to reflect school closing, but as the school is still open and has been continuously operating since before the school year 2005-2006, the data may be misreported.

The percentage of teachers graduating from a more competitive college (PCTCOMPCOLL, table 9) is generally high for schools in Oakland, with the highest maximum value of 52.38% at traditional public schools (N=204) and 53.85% at charter schools (N=14); Macomb shows the lowest maximum value with 20% for traditional public schools (N=145) and 13.64 for charter schools (N=6). The charter schools in Oakland (N=14) exhibit the largest minimum (2.33%) of teachers graduating from a competitive college, but the standard deviation is the largest (15.04), indicating an uneven picture among the fourteen charter schools.

The evaluation of the percentage of teachers owning a major or minor in their subject area (PCTMAJ_MIN, table 10) shows that the public schools in Wayne (N=354) and the schools in the Detroit Public Schools (N=147) have the highest maximum number of teachers with a major or minor (100%), the traditional public schools in Macomb (N=150) the lowest maximum number with 17.39% (but by far the lowest standard deviation with 3.80). The highest average number of 25.03% is calculated for the charter schools in Oakland (N=14).

The percentage of teachers holding a permanent, professional, or provisional license (PCTCERT, table 11) displays a number of 100% in the maximum category for all public schools (all three counties), and a low number of 76.92% for the charter schools in Oakland (N=204); the highest minimum values are calculated for the charter schools in Macomb (N=6) and Oakland (N=14) with 40.00%. the highest average value with 69.58% results for traditional schools in Macomb (N=146), the lowest for charter schools in Wayne (N=60) with 55.54%. The standard deviation for those charter schools is high with 18.32, indicating an uneven distribution of the values.

Overall evaluation of the five attributes (experience, turnover rates, competitiveness of college, possession of a major or minor, certification status) shows, somehow surprisingly, a favorable result for the schools in the Detroit Public Schools (N between 142 and 147) and the charter schools in Oakland (N=14).

In table 12, the percentage of teachers holding a substitute permit is calculated (PCTSUB); the charter schools in Macomb (with only N=3) and Oakland (N=11) contribute the highest minimum numbers with 28.57%, respectively 20.78%, the schools in Wayne show the highest maximum number with 100%⁴⁷ (354 traditional public schools, 56 charter schools), while the traditional public schools in Macomb (N=149) demonstrate the lowest maximum number of 41.67%. The Detroit Public Schools (N=147) have the lowest average with 7.63%, charter schools in Macomb (with only N=3 valid data sets) the highest average of 52.21%.

The percentage of pupils being eligible for free or reduced lunch (PCTFREEREDL) is displayed in table 13. All the schools report high numbers regarding the maximum percentage, if the lowest number (Macomb, charter schools, N=6) of 81.66% is disregarded, the range is between 91.12% (Macomb, public schools, N=153) and 99.18% (Wayne, charter schools, N=55). All schools, with the exception of the Detroit Public Schools (N=147, 14.83%) show a minimum of 0%. The average values cover the wide range between 79.42% (Detroit

⁴⁷ The very high percentage of 100% reported for teachers holding a substitute permit may be the result of flawed data. In sum, three schools show this high rate. The Discovery Arts and Technology Public School Academy (charter school) presents 100% of teachers holding a substitute permit, but 80% of the teachers being certified (80% for the variable PCTCERT). These numbers are contradictory. The other schools that report 100% for the variable PCTSUB are identified by school code 9613, charter school, respectively 9536, traditional public school. Both are displaying 0% for the variable PCTCERT. The traditional public school reports 100% for PCTNEWTEACHER. The charter school reports employing one teacher (with two years of teaching experience) and an otherwise empty data case.

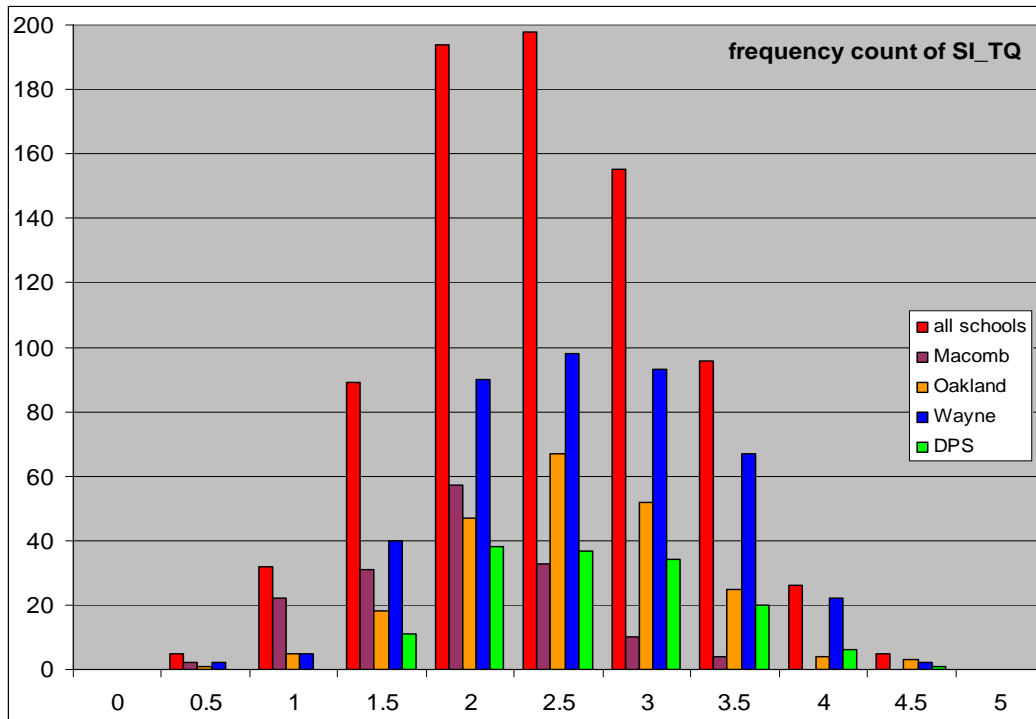
Public Schools, N=147) and 21.06% (Oakland traditional schools, N=201). The standard deviations are generally very large with values between 11.28% and 32.65%, indicating a very uneven distribution.

Table 13: *Percentage of Pupils Eligible for Free or Reduced Lunch (PCTFREEREDL)*

Area (number of schools: all/ PS/ CS)	PCTFREEREDL											
	Maximum			Minimum			Average			standard deviation		
	All	PS	CS	All	PS	CS	All	PS	CS	All	PS	CS
Macomb (153/147/6)	91.12	91.12	81.66	0	0	0	29.48	29.24	33.98	20.81	20.44	28.33
Oakland (212/201/11)	95.21	92.21	95.21	0	0	0	22.76	21.06	46.32	23.17	21.46	32.65
Wayne (405/350/55)	99.18	97.78	99.18	0	0	0	53.86	52.88	59.41	30.41	30.41	30.06
DPS (147/147/-)	95.32	95.32		14.83	14.83		79.42	79.42		11.28	11.28	
DetroitMA (770/698/72)	99.18	97.78	99.18	0	0	0	40.39	38.66	54.76	30.39	29.85	31.15

Analysis Regarding the Strength Indicator for Teacher Quality, Conclusions

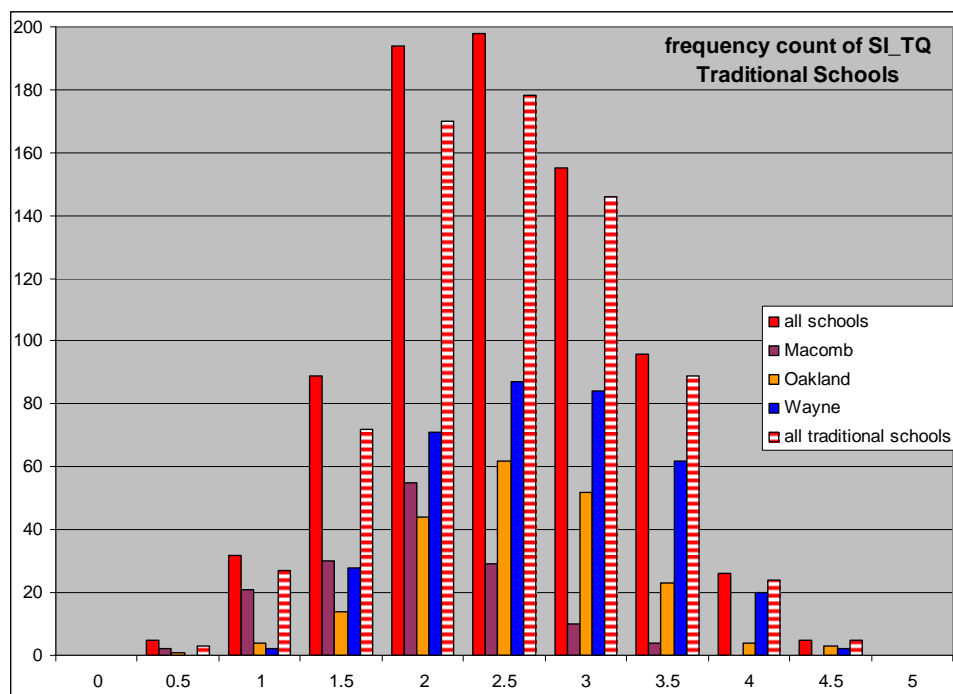
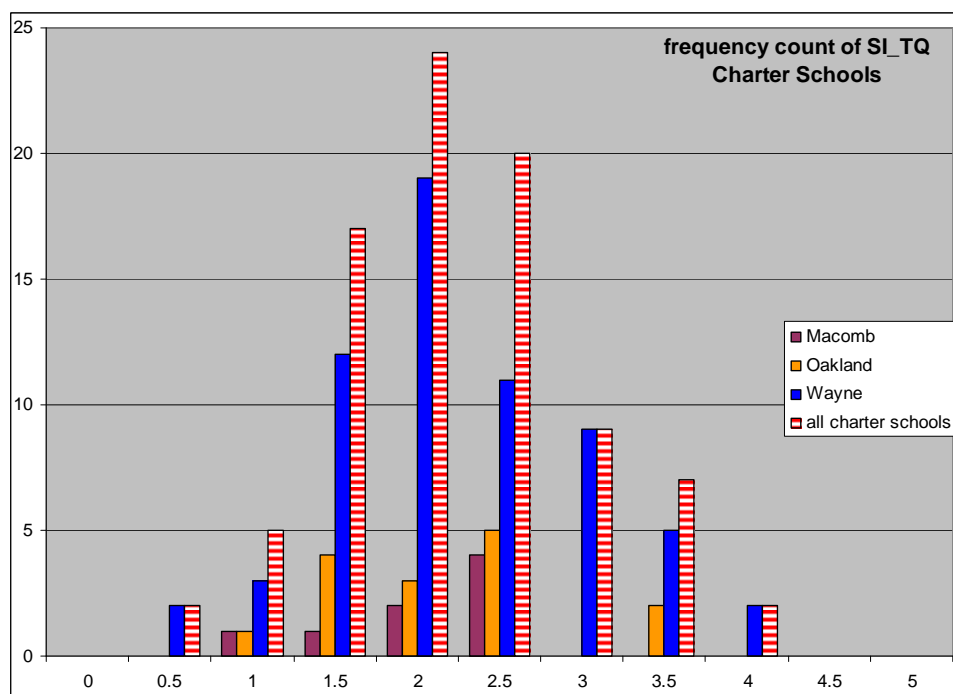
The strength indicator for teacher quality was developed by assigning values (as described in chapter III) to the five attributes here chosen to represent an effective teaching staff (years of teaching experience, certification status, competitiveness of the undergraduate institution, holding a major or minor in subject area, and teacher turnover rate), while the distinction when assigning those values was made by utilizing the individual averages and standard deviations. Each of the five attributes is assigned equal weight when calculating the indicator. The way the assignment of the values and the calculation of the strength indicator was conducted, an approximate normal distribution for the frequency count of SI_{TQ} for all included schools is to be expected. Figure 6 shows the result, for all schools, the schools distinguished by county, and the Detroit Public Schools (DPS). The frequency distribution for all schools included ($N=800$) is, indeed, approximately a normal distribution. The graphs regarding the Detroit Public Schools and the counties of Wayne and Oakland show the most similarity to the normal distribution. The graph representing the schools in Macomb is left-skewed, pointing to the fact that in Macomb for a higher number of schools a lower strength indicator is calculated, indicating a less qualified teaching staff.

Figure 6: *Frequency Count of SI_{TQ} – All Schools (N=800)*

When traditional schools (N=714) are tested (figure 7), the graph regarding traditional schools is – compared to the graph regarding all schools – right skewed, indicating a larger number of traditional schools with a higher strength indicator. And, again, the counties of Wayne and Oakland reveal almost no skew, while the graph for Macomb is, again, positive skewed (left skewed). This suggests a better qualified teaching staff in traditional schools in general than in all school, with the lesser qualified teaching staff in traditional schools in Macomb.

The frequency count regarding charter schools (N=86) results in a somewhat similar picture (figure 8). Overall, the charter school distribution is – slightly - positive skewed, indicating that the teaching staff at charter schools is generally lesser qualified than at traditional schools. The graph regarding the charter schools in

Oakland (N=15) comes closest to the distribution graph for all charter schools, the distribution graph for the schools in Wayne (N=63) is less close (even more positively skewed), and the graph regarding the charter schools in Macomb (N=8) is so left skewed, that it does not even show a right tail. This suggests a lesser qualified teaching staff at charter schools than at traditional public schools, with the least qualified teaching staff at charter schools in Macomb. But the results regarding charter schools in Wayne and especially Macomb should be considered with care as the numbers of evaluated charter schools were low for Oakland with 15 valid observations and extremely low for Macomb with only 8 valid observations.

Figure 7: Frequency Count of SI_{TQ} – Traditional Schools (N=714)Figure 8: Frequency Count of SI_{TQ} – Charter Schools (N=86)

Analytical Statistics - Conclusions

Correlation coefficients. The following tables, table 14 and 15, show selected Pearson's correlation coefficients, r , calculated for the data set; SPSS reported all of those correlation coefficients to be statistically significant at the 0.01 level. But not all statistically significant correlation coefficients were included, as some correlation coefficients SPSS stated as being significant were as low as, e.g., 0.202 (standing for a coefficient of determination, r^2 , of being as low as 0.041, indicating that only 4.1% of the variance is explained by the relationship of those two variables). The full matrix of the correlation coefficients is provided in appendix B. Correlation coefficients will be regarded as being large if they are between 1 and 0.5, respectively -1 and -0.5, and as being medium if they are between 0.5 (less than 0.5) and 0.3, respectively -0.5 (greater than -0.5) and -0.3.

With this distinction, an amount between 100% and 25% of the variance in one variable will be explained by large correlation coefficients and an amount between less than 25% and 9% of the variance will be explained by medium correlation coefficients. Some studies differentiate in even smaller correlation coefficients, ranging between 0.3 and 0.15, respectively -0.3 and -0.15. As those correlation coefficients express a very small amount of explained variance (less than 9%), they will not be included in this evaluation. As generally the success of schools, teachers, the educational system, is measured in test scores, the correlation coefficients will be presented in relationship to the average test scores (percent proficient in English, ELA, and mathematics, MATH, each grade 4 and 7). The numbers in brackets indicate N , the number of valid observations. .

Table 14: *Pearson's Correlation Coefficients r – Large Statistically Significant Correlations (Interval [-1;-0.5] Respectively [0.5;1])*

	ELA.GR4	ELA.GR7	MATH.GR4	MATH.GR7
AVG_ITOT				
AVG_HSEV	0.634 (604)	0.636 (264)	0.673 (604)	0.758 (264)
starting.teacher.salary				
salary.10year.teacher.w.master				
PCTMAJ_MIN				
PCTCOMPCOLL				
PCTNEWTEACHER				
PCTSEPARATEDTEACHER				
PCTFREEREDL	-0.698 (592)	-0.774 (250)	-0.758 (592)	-0.868 (250)
PCTCERT				
PCTSUB				

$\alpha = 0.01$

Table 14 (Pearson's, Correlation Coefficients r – Large Statistically Significant Correlations) represent the SPSS calculated large correlation coefficients between the variables measuring the educational outcome of the pupils (ELA.GR4, ELA.GR7, MATH.GR4, MATH.GR7) and the variables characterizing the school (PCTMAJ_MIN, PCTCOMPCOLL, PCTNEWTEACHER, PCTSEPARATEDTEACHER, PCTFREEREDL, PCTCERT, PCTSUB), respectively the district (AVG_ITOT, AVG_HSEV, starting.teacher.salary, salary.10year.teacher.w.master).

The SPSS results show a strong, positive, correlation between average residential wealth per pupil (AVG_HSEV), calculated on the district level, and all four assessed indices of educational outcome: English in grade 4 and 7, and mathematics in grade 4 and 7. This indicates that with a higher residential wealth per pupil the educational achievement, measured by MEAP test scores in English and mathematics, each grade 4 and 7, increases significantly.

The only other variable demonstrating a high correlation coefficient with all four considered educational measurements is the percentage of pupils being eligible for free or reduced lunch (PCTFREEREDL). All four correlation coefficients are indicating a strong, negative, relation, being interpreted that with a higher percentage of pupils being eligible for free or reduced lunch, the evaluated test scores decrease significantly. Both sets of findings are consistent with a large and growing research literature (Hedges, Laine, & Greenwald, 1994).

Table 15: *Pearson's Correlation Coefficients r – Medium Statistically Significant Correlations (Interval $(-0.5;-0.3]$ Respectively $[0.3;0.5)$)*

	ELA.GR4	ELA.GR7	MATH.GR4	MATH.GR7
AVG_ITOT				
AVG_HSEV				
starting.teacher.salary				
salary.10year.teacher.w.master				0.355 (223)
PCTMAJ_MIN	-0.396 (602)		-0.477 (602)	-0.393 (259)
PCTCOMPCOLL				
PCTNEWTEACHER				
PCTSEPARATEDTEACHER				
PCTFREEREDL				
PCTCERT				
PCTSUB				

$\alpha = 0.01$

Table 15 (Pearson's, Correlation Coefficients r – Medium Statistically Significant Correlations) represent the SPSS calculated medium correlation coefficients between the variables measuring the educational outcome of the pupils (ELA.GR4, ELA.GR7, MATH.GR4, MATH.GR7) and the variables characterizing the school (PCTMAJ_MIN, PCTCOMPCOLL, PCTNEWTEACHER,

PCTSEPARATEDTEACHER, PCTFREEREDL, PCTCERT, PCTSUB), respectively the district (AVG_ITOT, AVG_HSEV, starting.teacher.salary, salary.10year.teacher.w.master).

The correlation coefficients calculated by SPSS show a negative correlation coefficient of medium strength between the percentage of teachers possessing a major or minor in their subject area (PCTMAJ_MIN) and the academic achievement in English, grade 4, and mathematics in grade 4 and 7. This indicates that the educational outcome in English, grade 4, and mathematics in general will decrease with a higher percentage of teachers, that are actually teaching in their field. As the evaluated data set contains only data on elementary and middle school level, where the significance of the possession of a minor or major in the subject area may not be as important as on the high school level, this finding should be tested for high school level.

Additionally, the teacher salary of teachers possessing a masters' degree and being in the teaching profession for more than 10 years (salary.10year.teacher.w.master) shows a positive medium correlation with the test scores in mathematics, grade 7.

Summing up the results of the computed correlation coefficients, the large positive correlation coefficient between average residential wealth per pupil and the test scores in general and the large negative correlation coefficient between the percentage of pupils being eligible for free or reduced lunch and test scores in general are not surprising but were expected. The same can be stated for the large positive correlation coefficient between the test scores in mathematics, grade 7,

respectively the medium positive correlation coefficient with test scores in English, grade 7, and the percentage of certified teachers. Not surprising as well is the medium positive correlation coefficient between test scores in mathematics, grade 7, and the salary of a teacher with a masters' degree and more than 10 years of teaching experience. The medium negative correlation coefficients between the percentage of teachers possessing a major or minor in their subject area and the test scores in English, grade 4, and mathematics, grade 4 and 7, are of a somehow surprising nature, as this would indicate a negative correlation between teachers teaching in their field and pupils academic outcomes. But, generally the possession of a major or minor in the subject area is regarded as being more important for teachers teaching at high school level, therefore this finding has to be regarded with care.

Analysis of Variance. The analysis of variance (ANOVA) was conducted to determine whether there are statistically significant differences among the three counties or between the school types (traditional public school and charter school) regarding the variables (school, community, and pupil variables).

The following table (table 16, Analysis of Variance by County) reports the differences of the variables among the counties at the 0.05 level. This table was calculated in the ANOVA output as post hoc multiple comparisons. The values in italic are statistically insignificant values. With the exception of AVG_ITOT and PCTSUB all tested variables proved to show statistically significant differences among the counties, generally for all three counties.

Table 16: *Analysis of Variance by County, Comparisons*

Dependent variable	(I) county	(J) county	Mean difference	sig
N	N		(I) – (J)	
AVG_ITOT	Macomb	Oakland	-191.978	0.228
794	155			
	Oakland	Wayne	84.902	0.631
	221			
	Wayne	Macomb	107.076	0.564
	418			
AVG_HSEV	Macomb	Oakland	-46684.988	<0.001
794	155			
	Oakland	Wayne	105545.893	<0.001
	221			
	Wayne	Macomb	-58860.905	<0.001
	418			
starting.teacher.salary	Macomb	Oakland	2440.584	<0.001
785	158			
	Oakland	Wayne	-900.048	<0.001
	222			
	Wayne	Macomb	-1540.536	<0.001
	405			
salary.10year.teacher.w.master	Macomb	Oakland	5200.414	<0.001
732	155			
	Oakland	Wayne	-551.380	0.521
	222			
	Wayne	Macomb	-4649.034	<0.001
	355			
PercentProficient.ELA.GR4	Macomb	Oakland	-4.98543	0.040
605	117			
	Oakland	Wayne	15.98975	<0.001
	164			
	Wayne	Macomb	-11.00432	<0.001
	324			
PercentProficient.ELA.GR7	Macomb	Oakland	-5.43852	0.335
265	44			
	Oakland	Wayne	17.31165	<0.001
	61			
	Wayne	Macomb	-11.87312	0.001
	160			

Dependent variable	(I) county	(J) county	Mean difference	sig
N	N		(I) – (J)	
PercentProficient.MATH.GR4	Macomb	Oakland	-4.86298	0.045
605	117			
	Oakland	Wayne	17.69849	<0.001
	164			
	Wayne	Macomb	-12.83552	<0.001
	324			
PercentProficient.MATH.GR7	Macomb	Oakland	-5.60142	0.420
265	44			
	Oakland	Wayne	26.83869	<0.001
	61			
	Wayne	Macomb	-21.23727	<0.001
	160			
PCTCOMPCOLL	Macomb	Oakland	-7.44831	<0.001
773	151			
	Oakland	Wayne	1.65000	0.089
	218			
	Wayne	Macomb	5.79831	<0.001
	404			
PCTNEWTEACHER	Macomb	Oakland	5.56963	0.005
789	155			
	Oakland	Wayne	4.24753	0.008
	220			
	Wayne	Macomb	-9.81716	<0.001
	414			
PCTSEPARATEDTEACHER	Macomb	Oakland	-0.11595	0.989
789	155			
	Oakland	Wayne	-1.80512	0.014
	220			
	Wayne	Macomb	1.92107	0.023
	414			
PCTFREEREDL	Macomb	Oakland	0.0679931	0.038
770	153			
	Oakland	Wayne	-0.3188934	<0.001
	212			
	Wayne	Macomb	0.2509003	<0.001
	405			

Dependent variable	(I) county	(J) county	Mean difference	sig
N	N		(I) – (J)	
PCTMAJ_MIN	Macomb	Oakland	-4.84949	0.004
791	156			
	Oakland	Wayne	-6.27544	<0.001
	221			
	Wayne	Macomb	11.12493	<0.001
	414			
PCTCERT	Macomb	Oakland	3.32081	0.080
782	152			
	Oakland	Wayne	3.28982	0.020
	218			
	Wayne	Macomb	-6.61063	<0.001
	412			
PCTSUB	Macomb	Oakland	1.55568	0.620
778	152			
	Oakland	Wayne	-1.55366	0.470
	216			
	Wayne	Macomb	-0.00202	1
	410			

$\alpha = 0.05$

Oakland generally displays the highest values in the categories, where high values are desirable (AVG_ITOT, AVG_HSEV, PercentProficient.ELA.GR4, PercentProficient.ELA.GR7, PercentProficient.MATH.GR4, PercentProficient.MATH.GR7, PCTCOMPCOLL) and Wayne shows the highest values in the categories where lower values would have been looked for (PCTSEPARATEDTEACHER, PCTFREEREDL).

Table 17 sums up the findings in a different form. On the district level, three of the three comparisons are statistically significant for the variables AVG_HSEV and starting.teacher.salary. Only two of the comparisons are statistically significant regarding salary.10.year.teacher.w.master. The comparisons considering proxies for teacher quality are statistically significant for all three of the comparisons for two variables, PCTMAJ_MIN and PCTNEWTEACHER, and are statistically significant for

two of the comparisons for the variables PCTCERT, PCTSEPARATEDTEACHER, and PCTCOMPCOLL. On the student body level, all three of the comparisons are statistically significant for the variables PercentProficient.ELA.GR4, PercentProficient.MATH.GR4, and PCTFREEREDL; only two of the comparisons are statistically significant for the variables PercentProficient.ELA.GR7 and PercentProficient.MATH.GR7.

Table 17: *Analysis of Variance by County, Number of Statistically Significant Comparisons for the Variables*

	Number of statistically significant comparisons			
	0	1	2	3
district level	AVG_ITOT	salary.10.year. teacher.w.master	AVG_HSEV starting.teacher.salary	
proxies for teacher quality	PCTSUB	PCTCERT PCTSEPARATEDT EACHER PCTCOMPCOLL	PCT_MAJ_MIN PCTNEWTEACHER	
attributes of the student body		PercentProficient. ELA.GR7 PercentProficient. MATH.GR7	PercentProficient. ELA.GR4 PercentProficient. MATH.GR4 PCTFREEREDL	

$\alpha = 0.05$

The following table, table 18, reports the statistically significant results of ANOVA for the variables by the type of the school: traditional public school and charter school. All variables show statistically significant differences; the results for the variable AVG_HSEV have to be disregarded, because charter schools have a zero value for this variable. All the significance levels are less than 0.001 (with the exception of PercentProficient.ELA.GR7, where the significance level is still small at 0.003) and some of the F-values are extremely large, e.g., AVG_ITOT (F=227.566), PCTSEPARATEDTEACHER (F=256.396), and PCTSUB (F=650.844). As the F-value represents the ratio of the means of squared deviation (representing a variance) from the “between groups” value divided by the “within groups” value, F would be expected to be 1 if the null hypothesis were true. With larger F-ratios the differences in the mean squares, the variances, are therefore larger.

Table 18: *Analysis of Variance by School Types*

Dependent variable	N (charter schools/ public schools)	means (charter schools/ public schools)	F	sig
AVG_ITOT	86/ 708	3,731/ 5,427	227.566	<0.001
AVG_HSEV	86/ 708	0/ 129,810	196.638	<0.001
starting.teacher.salary	73/ 712	35,807/ 38,575	71.600	<0.001
salary.10year.teacher.w.master	23/ 708	69,726/ 74,669	14.286	<0.001
PercentProficient.ELA.GR4	73/ 531	53.53/ 74.86	102.352	<0.001
PercentProficient.ELA.GR7	56/ 208	56.35/ 65.43	8.767	0.003
PercentProficient.MATH.GR4	73/ 531	59.22/ 78.73	80.323	<0.001
PercentProficient.MATH.GR7	56/ 208	33.99/ 48.47	15.099	<0.001
PCTCOMPCOLL	79/ 691	13.75/ 8.92	17.717	<0.001
PCTNEWTEACHER	80/ 705	42.83/ 14.51	67.352	<0.001
PCTSEPARATEDTEACHER	80/ 705	12.08/ 4.84	256.396	<0.001
PCTFREEREDL	72/ 697	54.76/ 38.66	52.592	<0.001
PCTMAJ_MIN	80/ 707	22.86/ 9.58	60.227	<0.001
PCTCERT	80/ 699	56.69/ 65.67	27.132	<0.001
PCTSUB	70/ 704	47.22/ 10.40	650.844	<0.001

$\alpha = 0.05$

Predictive Statistics - Conclusions

The regression model was estimated utilizing weighted least squares, with each case weighted by square root of number of teachers at each individual school, because the error terms are likely not of equal variance for each observation. As the variables are on different scales (e.g., AVG_ITOT is much larger than \$1,000, and the dependent variables are on a percentage scale between 0 and 100), the variables AVG_ITOT, AVG_HSEV, starting.teacher.salary, and salary.10year.w.master were transformed by dividing the values by 1,000 before the regression was done. This transformation does not change the results for sig, t, and the standardized β ; the result for the B-value is the only “changed” value, it is transformed, multiplied by 1,000.

All the regression coefficients presented in table 19 (Statistically Significant Regression Coefficients) are reported statistically significant by SPSS at the 0.05 level.

Table 19: *Statistically Significant Regression Coefficients*

independent variables		PROXY FOR TEACHER QUALITY (DEPENDENT VARIABLE)					
		PCTNEW TEACHER N=709	PCTCOMPCOLL N=695	PCTSEPARATED TEACHER N=709	PCTMAJ_MIN N=709	PCTCERT N=702	PCTSUB N=704
AVG_ITOT	sig	<0.001			S		0.018
	t	-5.599					-2.371
	B	-2.683					-0.947
	β	-0.205					-0.096
AVG_HSEV	sig		0.025			0.007	<0.001
	t		2.253			2.695	-3.851
	B		0.015			0.270	-0.028
	β		0.146			0.182	-0.253
starting.teacher.salary	sig	0.040	0.012	0.002	<0.001		
	t	2.056	-2.525	3.160	5.546		
	B	0.551	-0.499	0.386	1.345		
	β	0.092	-0.124	0.157	0.253		
salary.10year.teacher. w.master	sig				0.005		
	t				-2.838		
	B				-0.259		
	β				-0.137		
PCTFREEREDL	sig	0.003	0.020	<0.001	<0.001		
	t	-2.961	-2.335	3.668	4.984		
	B	-7.687	-4.484	4.345	11.711		
	β	-0.172	-0.149	0.237	0.297		
X1 (Wayne)	sig	<0.001	0.044	0.001	0.010		<0.001
	t	-6.447	2.021	-3.398	-2.599		-5.609
	B	-7.741	1.788	-1.861	-2.823		-5.631
	β	-0.292	0.100	-0.171	-0.121		-0.284
X2 (Macomb)	sig	<0.001	<0.001		<0.001	<0.001	
	t	4.078	-4.572		-5.910	3.733	
	B	5.595	-4.636		-7.336	5.905	
	β	0.172	-0.212		-0.256	0.180	
R ² (in %)		27.5	14.3	10.2	23.7	5.6	10.8

 $\alpha = 0.05$

The cells show the significance (i.e., p-value, or probability that the null hypothesis is true), the t-value, B-value, and the standardized β . Overall, the results of the regression analyses demonstrate a significance for all the tested variables as predictors for teacher quality, measured by the introduced proxies. The R^2 value,

indicating the amount of explained variance, ranges between the low value of 5.6% (PCTSUB) and a high value of 27.5% (PCTNEWTEACHER).

The t-values are somewhat close together, ranging from -6.447 to -1.659, respectively from 2.021 to 5.546. The largest t-values are determined for Wayne as a predictor for PCTNEWTEACHER and PCTSUB, Macomb as a predictor for PCTMAJ_MIN, starting.teacher.salary as a predictor for PCTMAJ_MIN, and AVG_ITOT as a predictor for PCTSEPARATEDTEACHER.

The B-values and the standardized β -values stand for the departure from the horizontal line (of course, it is only a line in a two dimensional setting) or the difference of the change influenced by the independent variable(s). The values symbolize the strength of the relationship between the independent variable(s) and the dependent variable. In case of a zero value for B or β , there would be no relationship between the variables, and, the larger the relationship is, the greater is the accuracy of the prediction. The largest standardized β -values are determined between PCTFREEREDL and PCTMAJ_MIN (0.297), X1 (Wayne) and PCTNEWTEACHER (-0.292), and X1 (Wayne) and PCTSUB (-0.284), followed by the pairs X2 (Macomb) \leftrightarrow PCTMAJ_MIN, starting.teacher.salary \leftrightarrow PCTMAJ_MIN, AVG_HSEV \leftrightarrow PCTSUB. The smallest standardized β values are reported for the pairs starting.teacher.salary \leftrightarrow PCTNEWTEACHER (0.092) and AVG_ITOT \leftrightarrow PCTSUB (-0.096).

The regression model shows the important determinants of teacher quality are Wayne County (significant in five equations), Macomb County, starting.teacher.salary, and PCTFREEREDL (each significant in four equations), and

AVG_HSEV (significant in three equations). The remaining two independent variables, AVG_ITOT (significant in two equations) and salary.10year.teacher.w.master (significant in only one equation), are of lesser importance.

Wayne County. Wayne County displays significance in five of the six equations. The standardized β is negative for PCTNEWTEACHER, an expected finding against the background of an increased number of layoffs in Wayne due to declining enrollment numbers and therefore no new hires, negative for PCTSEPARATEDTEACHER, an unexpected finding that demands further research to determine possible explanations, negative for PCTMAJ_MIN, that is, again, an expected finding against the background of declining enrollment numbers and teacher reassignments, and negative for PCTSUB, another surprising finding that may require additional research to determine explanations. The β -value is positive for PCTCOMPCOLL, that can be explained by the high number of charter schools in Wayne; those schools tend to hire graduates from more competitive colleges. Further research can be done to strengthen this explanation for PCTCOMPCOLL by introducing a third dummy variable to represent the school type (e.g., 0 representing traditional public schools and 1 representing charter schools) and to perform a regression with this additional independent variable.

Macomb County. Macomb County displays significance in four equations. The standardized β is negative for PCTCOMPCOLL, a finding that can, again, be explained by the number of charter schools; this time by the low number of charter schools (and, again, additional research including with a dummy variable for the

school type, can be done to strengthen this explanation). PCTMAJ_MIN reports a negative β -value and PCTNEWTEACHER a positive β -value. As Macomb has been home to growing communities over the last years, this is mirrored in increased hiring of teachers (positive β). The districts may have had a lesser focus on formal qualifications (owning a major or minor in subject area) because of the supply of candidates (negative β for PCTMAJ_MIN). The standardized β for PCTCERT is positive, intuitively this can indicate that the new hired teachers possess higher certification statuses.

Starting.teacher.salary. The starting teacher salary demonstrates significance in four equations: PCTNEWTEACHER (positive β -value), PCTCOMPCOLL (negative β -value), PCTSEPARATEDTEACHER (positive β -value), and PCTMAJ_MIN (positive β -value). The finding for PCTCOMPCOLL can be explained by the lower starting salary of charter schools and the preference of charter schools to hire teachers from more competitive colleges. The results for PCTNEWTEACHER and PCTMAJ_MIN are expected, the finding for PCTSEPARATEDTEACHER is unexpected.

PCTFREEREDL. The variable PCTFREEREDL displays significance for PCTNEWTEACHER (negative β -value), PCTCOMPCOLL (negative β -value), PCTSEPARATEDTEACHER (positive β -value), and PCTMAJ_MIN (positive β -value). The negative β -values are explained by poor districts who lay off teachers because of declining enrollment numbers (PCTNEWTEACHER) and generally do not hire teachers from more competitive colleges. An explanation for the positive β -value for PCTSEPARATEDTEACHER is that teachers may tend to leave districts

with a higher number of socioeconomic disadvantaged children. The finding for PCTMAJ_MIN is somehow unexpected.

AVG_HSEV. The average residential wealth per pupil, *AVG_HSEV*, is significant in three equations. It reports a positive β -value for PCTCOMPCOLL and PCTCERT, and a negative β -value for PCTSUB. These findings are all expected, as wealthy communities prefer to hire teachers from competitive colleges and teachers that own a certification, but not teachers who hold a substitute permit.

When the findings of the regression analysis are summed up, the results confirm that there exists evidence of teacher sorting, of non random assignment of teachers across districts. Teacher characteristics, like PCTNEWTEACHER, PCTCOMPCOLL, PCTSEPARATEDTEACHER, PCTMAJ_MIN, PCTCERT, and PCTSUB are, indeed, correlated with a set of school and student characteristics, like average residential wealth per pupil, average total expenditure per pupil, average starting teacher salary, average teacher salary for a teacher with a master's degree and 10 years of teaching experience, the percentage of pupils being eligible for free or reduced lunch, and the county (Oakland, Macomb, Wayne) where the district/school is located. Three of these proxies for teacher quality (PCTNEWTEACHER, PCTCOMPCOLL, PCTMAJ_MIN) are each predicted by a (different) set of five of the seven independent variables; but for all of these three proxies the starting teacher salary, the percentage of pupils being eligible for free or reduced lunch, and the county (represented by two dummy variables) were significant predictors. Student achievement measures were not correlated with teacher characteristics. Compiling

the results, the pattern that better teachers tend to teach in more affluent communities is supported by the findings.

CHAPTER V: LIMITATIONS, SUMMARY, CONCLUSIONS, RESEARCH AND POLICY RECOMMENDATIONS, FINAL REMARKS

Building up on the findings in chapter IV and results from prior research, there are a number of recommendations for further research and new policies to be made that may, indeed, result in eye-opening research results or in outcome-changing policies. But, first, the focus will be on the limitations and the summary of this study.

Limitations

The available data set does not include private schools, parochial schools, or high schools at all, only elementary and middle schools; especially, the findings on high school basis might show different results. Further on, the results regarding the charter schools in Oakland and especially in Macomb are not highly reliable, as the number of valid cases was low with a maximum of 15 for charter schools in Oakland and a maximum of 8 for charter schools in Macomb. Finally, the salary data (starting.teacher.salary and salary.10year.w.master) did not provide any valid case for charter schools in Wayne and the variable starting.teacher.salary was estimated by 90% of the average teacher salary at the individual school. Although this replacement can be regarded as a good approximation of the exact data, exact data would result in more accurate findings. As Wayne houses 63 out of the 86 charter schools in the scrutinized area, the missing of these cases may have produced unreliable results.

Summary and Conclusions

With the results of the data analyses in chapter IV, it will be determined if the hypotheses established in chapter III are supported by the findings.

The first hypothesis, *Teacher quality is not randomly distributed in the Detroit Metropolitan region*, is supported by the results; the three counties of Wayne, Oakland, Macomb, and the Detroit Public Schools do not show the same distribution of teachers with the utilized proxies for teacher quality, additionally the educational outcome and the district variables show significant differences. The analysis of variance by county provides the comparison of educational achievement in the three counties. The largest statistically significant differences in all four measured categories (PercentProficient.ELA.GR4, PercentProficient.ELA.GR7, PercentProficient.MATH.GR4, and PercentProficient.MATH.GR7) are always reported between Wayne and Oakland, with pupils in Wayne scoring lower than pupils in Oakland (and Macomb) all the time. Both variables representing the teacher salary (starting.teacher.salary and salary.10year.teacher.w.master) result in the same outcome: the largest statistically significant differences are occurring between Oakland and Macomb. The teachers in Macomb are generally paid a higher salary than in Oakland (and Wayne). The differences of the average residential wealth per pupil across the three counties are all statistically significant, with Oakland reporting the highest average residential wealth and Wayne the lowest.

The second hypothesis, *Urban schools have lesser-qualified teachers*, is mirrored by the Detroit Public Schools (with an extremely high number of pupils being eligible for free or reduced lunch), where, surprisingly, the percentage of

teachers with less than three years of teaching experience is low and the average of teachers possessing a major or minor in their subject area is high, but teachers tend to leave their unit and come in lesser numbers from a competitive college. The Detroit Public Schools have been facing declining enrollment numbers over the last years and have answered this trend with teacher layoffs; this explains the surprisingly low percentage of teachers with less than three years of teaching experience, because, according to the collective bargain agreement, new hired teachers will be the first to be laid off. The possession of a major or minor in the subject area does not seem to be correlated with measured achievement; this proxy may be a more valid variable for high school teachers.

The third hypothesis, *Charter schools have a different teacher body characteristic than comparable traditional public schools*, is indeed supported, as charter schools show a less qualified teaching staff measured by the utilized proxies. The average for the percentage of teachers with less than three years of teaching experience is extremely high, especially in charter schools in Macomb, a very high percentage of teachers has left their charter school in 2005-2006. On the other hand, a high percentage of teachers employed at charter schools have graduated from a competitive college or possess a major or minor in their subject area. The strength indicator for teacher quality shows the same trend, that charter schools have, indeed, a lesser qualified teaching staff.

The last hypothesis, *teacher quality is depending on school resources, pupil's characteristics and their test scores - the more school resources are available, the lower the number of economically disadvantaged pupils is, and the higher the*

students test scores are, the better the teachers are to be expected, is again, supported by the high number of statistically significant regression coefficients. The average total instructional expenditures per pupil, the average residential wealth per pupil, the teacher salary (starting salary), the percentage of pupils being eligible for free or reduced lunch, and the county are all significant in relationship to two or more of the predicted variables (percentage of teachers with less than three years of teaching experience, percentage of employed teachers having graduated from a competitive college, percentage of teachers leaving the unit in 2005-2006, percentage of teachers possessing a major or minor in subject area, percentage of teachers holding a professional or permanent certification or a substitute permit).

Evidence of teacher sorting is particularly strong in Wayne County, with statistically significant results for five out of those six variables. The remaining explanatory variable, the average salary of a teacher with a masters' degree and 10 years of teaching experience, is significant in only one equation, the percentage of teachers possessing a major or minor in their subject area. But the possession of a major or minor in the subject area may not be a particular valid proxy to measure teacher quality at the elementary or middle school level.

Pearson's correlation coefficients are large between all four achievement measurements and the average residential wealth per pupil and the percentage of pupils being eligible for free or reduced lunch. All the correlation coefficients between PCTMAJ_MIN, PCTSEPARATEDTEACHER, PCTCERT, and PCTSUB as proxies for teacher quality and the four achievement measurements (mathematics and English, grades 4 and 7) are statistically significant. The remaining two proxies for

teacher quality, PCTCOMPCOLL and PCTNEWTEACHER, show significance only for three, respectively one, of the achievement measurements and the reported correlation coefficients are small. The largest correlation coefficients are reported between PCTMAJ_MIN and the four achievement measurements, although the correlation coefficients are all negative. This finding may again be based upon the fact that only elementary and middle schools are included in the data set; the correlation coefficients for high schools are expected to be positive for PCTMAJ_MIN. The correlation coefficients between PCTSEPARATEDTEACHER and the four achievement measurements are, according to expectation, all negative and their values are between -0.277 and -0.208. The correlation coefficients between PCTCERT and the achievement measurements are all positive, though small, as they are between 0.183 and 0.271, and the correlation coefficients between PCTSUB and the achievement measurements are negative and between 0.183 and 0.273. These findings support prior research that a higher percentage of teachers leaving a teaching unit has a negative impact on the educational outcome and that a higher percentage of teachers holding a permanent or professional license has a positive impact on pupils' achievement (and, of course, a higher percentage of teachers holding a substitute permit has a negative impact on the educational outcome).

Research Recommendations

Research regarding the kind of policies that will have the greatest impact on educational outcome has to be done. The resulting policies, aiming at higher

educational achievement of all pupils, can then be employed and will, hopefully indeed, lead to an improved educational outcome for the lower performing pupils.

Objective, widely supported measurement of teacher quality. One important goal when conducting studies regarding teacher quality is to find a more direct, more objective, and unanimously supported, measurement of teacher quality (or a vector of measurements) that mirrors the teacher's effectiveness at increasing pupils' academic achievement. This hard to attain goal might be achieved, or at any rate approached, by setting up a set of studies over a large number of distinctive locations (e.g., school types, student body, socioeconomic background, communities, states) and researching the influence of teachers' attributes on pupils' academic achievement. The setup regarding the teachers' attributes and the way the academic outcome is measured has to be identical for all locations. The teachers' attributes have to be measured identically in each study, so that, e.g., the certification status could not be a measurement if comparisons across states were made, because the requirements for certification vary from state to state. Additionally, the students' academic outcome has to be measured by one identical tool, not a set of tools that differ from state to state.

A pre-step might be to focus on one state at a time (then state specific measurements could be included) to find a set of possible measurements and to narrow them down in further research. During the development of a vector of measurements other, even harder to measure, personal attributes (e.g., engagement, enthusiasm, ability to convey knowledge) can be included on a trial

basis – but with those attributes it will be even harder to agree upon an objective way to assess them in a teacher.

Value-added analysis with data on the individual teacher. The “Race to the Top” program, announced July 2009 by the Obama administration, provides funding requirements that assign points, e.g., for improvements of teachers’ effectiveness based on students’ performance. The data systems of participating states will move in the direction to collect pupils’ achievement data in relation to individual teacher data. With those additional data sets, value-added analysis can be conducted to determine who the effective teachers are.

Follow the career moves of teachers. It would be desirable to have individual data on the teacher available for a number of consecutive years, so that a research could be set up to follow the movement of the teacher from one school to the next, to scrutinize the subsequent employment location, to determine especially the movement of the more qualified teachers. The research question would be if the more qualified teachers do, indeed, tend to gravitate towards schools/ districts with a more affluent student body than the school/ district they are about to leave. The hypothesis would be that the distribution of higher qualified teachers has gotten more unequal during the observed time period. Even with a data set similar to the one utilized in this research (where data are available on a school basis), that covers a number of consecutive years, the general movement of teachers from one school to the next could be followed and evaluated by utilizing the averages for the teaching staff. Additionally, the trend in the development of the strength indicator for teacher quality could be calculated for the scrutinized time period and the hypothesis would

be that in lower performing schools, less affluent schools, the strength indicator either decreases more than in more affluent schools or increases less than in more affluent schools.

Career moves of the more qualified teachers. With data on the individual teacher, it should also be tested whether the hypothesis that more qualified teachers tend to change to a job in the administration in higher proportions is supported, as well as whether higher qualified teachers are more likely to make a career move and quit working in the education system altogether.

Motives for leaving the teaching profession. The motives that cause higher qualified teachers to leave the teaching profession, or, better, to stay in the teaching profession, can be researched by utilizing a database on the individual level. Research in North Carolina (Clotfelter, Glennie, Ladd, & Vigdor, 2008) supported the hypothesis that an increase in the annual salary decreased the teacher turnover rate in general. DeAngelis (2000) found that an increase of the relative teacher salary does have an impact on the quality of available female teachers.

District hiring practices. Studies regarding district hiring practices should focus on the specifications in the collective bargain agreements, as the rules and regulations might serve as a sorting mechanism. Further, survey data on school district screening and individual hiring practices should be collected and evaluated (e.g., some schools invite candidates for a teaching job for a whole day to assess their qualifications, while others, in less affluent districts, may sign candidates on job fairs). Additionally, the number of candidates applying for a job has to be considered, because, again, less affluent districts/ schools have less supply of applicants.

Attributes of the student body and the community. The fraction of minority pupils (in Michigan measured by percentage of African-American pupils because of the general composition of the population in the state) should be included as a further attribute of the student body. The schools or districts could additionally be identified and differentiated by average household income of the community, percentage of adults with a college degree in the community, and pupil per teacher ratio. The hypothesis here would be that schools with a higher number of minority pupils and a less affluent community tend to employ a lower number of higher qualified teachers.

Policy Recommendations

The goal of new policies should take into consideration that the person who is at the center of the pupil's learning process is the teacher. As those policies generally aim at increasing the students' academic achievement, it has to be focused on teacher quality and the labor market in general; schools have to be able to be competitive when talent is hired from the market. The current distribution/sorting of teachers indicates a great disadvantage for pupils that fall in the categories of poor, non-white, low-income, or urban children. It is absolutely necessary to focus on policies that will attract and retain high qualified teachers in low-performing schools

School accountability programs. School accountability programs should take the kind of teachers that a specific school district has employed into consideration. A school where the teachers with the more desirable attributes pile up should be expected to have a better educational outcome than a school where teachers are

accumulated that do not own the desired attributes – or own them in a lesser grade and number. It is a logical conclusion that, e.g., a school with a less affluent student body and less qualified teaching staff has no chance to perform on the same level as a school in a more affluent community has where the pupils are taught by more qualified teachers – no matter how exactly the qualification of teachers is measured. A re-distribution of qualified teachers across schools is obviously necessary to achieve the goal of the No Child Left Behind legislation, that by the year 2014 all pupils (100% of every school's population) demonstrate proficiency in reading and mathematics. Then, with this re-distribution, the level of performance for pupils can be set equally high across schools and districts.

Bring teaching talent to the classroom. And retain it. Efforts should be taken to try to professionalize teaching. Effective educational personnel have to be present in the classroom to ultimately enhance pupils' academic achievement. Aggressive recruitment of the best of a high school graduation class followed by a rigorous selection process according to standardized criteria during the prospective teachers' training on the university level should provide the schools with a pool of high potential applicants. These standardized criteria should not be neglected or weakened during times of teacher shortages. Schools/ districts with a less affluent community or a higher percentage of low performing or minority pupils should have the means to offer incentives to high qualified teachers.

A good teacher promoted to an administrative position is the loss of a good teacher for the school, the classroom. Therefore, like in some business companies, a career path, with adequate financial compensation, within the teaching profession

could be created, e.g., a “specialist” teacher, so that a good teacher will be rewarded for staying in the teaching profession.

Additional incentives could be provided for teachers who undergo further voluntary training or certification. In the Texas Idea Public School District, the teachers get the fee for the NBPTS certification reimbursed and receive an extra salary of \$3,500 per year⁴⁸ after their certification. In the Whitmore Lake Public School District in Michigan, a NBPTS certified teacher will move up to the next rank of the salary level⁴⁹; that is equivalent to a 2.5% pay increase.

Teacher testing and certification. Germany has a similar, federalistic, structure as the United States and provides a high, uniformly applied, certification standard for teachers (requiring the study of the major and minor at an accredited university and subsequent graduation with a diploma). This idea of a uniform standardization process for testing and certification purposes could be employed in the United States, with standards being valid for any and every state.

Find ways to make “teaching” a desirable profession. As schools have to compete on the labor market for talent, teaching should be held at high esteem and not have less prestige than other jobs. An occupation with a higher prestige will automatically attract more graduates from the upper level of a cohort. The compensation of teachers should mirror their responsibility in the education of tomorrow’s society. As far back as 1963, this was a point open to critique, as

⁴⁸ Retrieved from www.nbpts.org/userfiles/File/Texas31Oct07.pdf, April 9, 2010

⁴⁹ Retrieved from <http://www.nbpts.org/UserFiles/File/Michigan23July07.pdf>, April 9, 2010

John F. Kennedy⁵⁰ said “*modern cynics and skeptics see no harm in paying those to whom they entrust the minds of their children a smaller wage than is paid to those to whom they entrust the care of their plumbing.*” In today’s world, teachers are usually paid according to their seniority, a change to merit based pay, performance based pay – or a mixture of both – would reward excellent teaching. As long as teachers are paid based solely on their seniority, committed, hardworking, and innovative teachers are paid the same salary as underperforming teachers on the same seniority level. There does not exist any sector of the economy that operates that way and is working effectively.

An additional approach is to introduce market sensitive salary structures that provide higher salaries for those teachers teaching in areas of chronic shortage (e.g., math, the sciences, special education). Better talent can be recruited when the salary comes close to – or even matches – what college graduates can earn in business or industry. Those teachers who are willing to focus on those areas of shortage will be rewarded. Further, the working conditions, especially in high poverty schools, have to be improved for teachers. Safety issues must be resolved. Teaching children at school the fundamentals is investing in the future of our society, laying down the basics, educating tomorrow’s leaders, this has to be understood by the whole society. When scrutinizing the teachers’ pay in percent of the GDP per

⁵⁰ Remarks in Nashville at the 90th Anniversary Convocation of Vanderbilt University, May 18, 1963, President John F. Kennedy, retrieved July 7th, 2009, from <http://www.jfklibrary.org/Historical+Resources/Archives/Reference+Desk/Speeches/JFK/003POF03Vanderbilt05181963.htm>

capita, ranging from Germany and South Korea with 141 to Finland, Singapore, and the OECD average of 95, the United States trails with 81 (McKinsey, 2007).

Low performing schools/ districts. Merely increasing the number of qualified teachers will not alter the educational outcome of low performing schools. Salary incentives and a safe working environment should provide a framework to provide low performing school access to highly qualified teachers. On top of that, there is NCLB and state laws that impose sanctions on schools that do not meet AYP, so that more qualified teachers will likely tend to avoid working in schools/ districts that do not meet the required standards.

Hiring Policies. Overhaul the hiring practices for teachers: the principal should get more authority in the hiring process and set higher standards for candidates. In other countries, the selection process for teacher applicants is more rigorous (McKinsey, 2007). McKinsey reports that, e.g., in Singapore only the top 30% of their cohort are accepted, after an additional rigorous, comprehensive selection process, so that only 1 in 6 applicants is accepted to become a teacher. In Finland, it is even more drastic, with the top 20% of a cohort undergoing a rigorous, comprehensive selection process, with finally only 1 in 10 applicants being accepted to become a teacher. In Germany, the teachers have to graduate from a college (generally an education of at any rate four years, full time), and usually only the very top performing graduates get employed as teachers. As some districts in Michigan currently do not have the means to be finicky when it comes to the hiring process, as they can not be choosy, and these are generally the districts with lower performing

pupils, these districts must be enabled to be picky, be it through increased financial means or administrative support.

Final Remarks

Whatever results studies of educational outcomes provide, whatever we try to increase the pupils' achievement, whatever academic outcomes new interventions or alternate hiring practices have, we have to continue to focus on finding the most effective and efficient way to increase the educational outcome of our pupils. We, as a society, have to be aware of the fact that every effort, every amount of money, we invest in the educational process is an investment in our future, the future of this country, and, ultimately, the future of the world. Only with a population of well educated people can we sustain and nurture our democracy. Education regards any and every person living in today's world. The current trend of diminishing educational progress, often excused by less resources, puts this nation at peril to lose the ability to teach today's pupils according to the democratic value system. The discussion about resources, originated in money, poses to be a dangerous discussion, as we have to assign the highest priority to education as a means to raise the level of education of today's population in a more globalized world, where the United States has to stay competitive with other nations, where, e.g., because of outsourcing options, job applicants in the United States has to compete against well trained applicants in India. As the teacher is the facilitator in the educational process, the United States will have to focus on finding the best, the most effective and efficient, personnel to staff schools and retain the teachers who provide the best educational

outcome, if this country wants to stay competitive and on a high level in the global economy.

APPENDIX A: Teacher Certification System in Michigan⁵¹

Michigan sports a number of teaching certificates/ permits under the current valid certification system. Besides taking the permanent certificate, the highest possible certification under the preceding certification system, into consideration, this study utilizes three of the current categories: the permit (as a general class), the provisional certificate, and the professional certificate.

Permits

Michigan provides four different types of permit: the Substitute Permit, the Full-Year Permit, the Emergency Permit, and the Section 1233b Permit. Non-certified teachers may teach under the issuing of a permit to a school district/ school that cannot find an appropriately certified teacher to fill a vacancy or for day-to-day substitute teaching assignments. Permits are generally valid only for the school year for which they are approved.

The *Substitute Permit* authorizes a school district/ school to employ a person as a substitute teacher on a day-to-day basis when the regular teacher is temporarily absent. The substitute permit is not valid for any regular or extended teaching assignment (more than 90 calendar days). The required qualifications for the substitute teacher are the completion of 90 semester hours of satisfactory credit at one four year, regionally accredited college or university.

The *Full-Year Permit* authorizes a school district/ school to employ a person in a long-term assignment more than 90 calendar days in the same classroom. The

⁵¹ Retrieved June, 3rd, 2009, from

http://www.michigan.gov/documents/cert_update_manual_2006_171904_7.pdf

required qualifications are the completion of a bachelor's degree from an approved teacher preparation institution and, if the assignment is in a core area, the completion of an academic major in the subject area to be taught or passage of the appropriate State Board approved subject area test.

The *Emergency Permit* authorizes a school district/ school to employ a person who does not meet the requirements for a full-year permit in a long-term assignment of more than 90 calendar days. It is issued only in emergency situations and will not be approved for core subject areas. The necessary qualifications are the completion of a bachelor's degree in the content area to be taught at a regionally or nationally accredited college or university or current enrollment with the completion of at least 90 semester hours in an approved teacher preparation program.

The *Section 1233b Permit* authorizes the employment of a non-certificated, non-endorsed teacher in the subject areas of computer science, foreign language, mathematics, biology, chemistry, engineering, physics, and robotics in grades 9 to 12. The candidate must possess an earned bachelor's degree from an accredited postsecondary institution and own a major or graduate degree in the field of specialization in which he/ she will teach. Further on, he/ she must have not less than two years of occupational experience in the field of specialization in which he/ she will teach (during the five-year period immediately preceding the date of hire). Those who will teach in the area of foreign language are exempt from this requirement.

Provisional Certificate

The Provisional Certificate represents Michigan's initial teaching certificate. The most essential criteria for the award of the provisional certificate are the successful completion of an approved elementary or secondary teacher preparation program, including student teaching, and the passing of all components of the Michigan Test for Teacher Certification, as well as the Basic Skills test (reading, writing, and math), and appropriate subject area examinations. A certificate will be valid for up to 6 years during which the holder is expected to gain at least 3 years of successful teaching experience, and to complete at least 18 semester hours in a planned course of study as a prerequisite for the next level of certification. A Provisional Certificate may be renewed; each renewal is valid for up to 3 years. The first renewal requires completion of 9 semester hours in a planned course of study; the second renewal requires completion of 18 semester hours in a planned course of study. An additional 3-year renewal requires the sponsorship of the local school district or private school and approval of the Michigan Department of Education.

Professional Education Certificate

The Professional Education Certificate represents Michigan's most advanced teaching certificate. The basic parameters are the requirement of completion of 18 semester hours in a planned course of study after the issuance of an approved initial teaching certificate (or an approved master's degree earned at any time), 3 years of successful teaching experience, and the meeting of the reading requirement (6 semester hours of teaching of reading or reading methods for elementary and 3 semester hours for secondary). The necessary renewal of the

Professional Education Certificate after five years demands the meeting of continuing education requirements.

APPENDIX B: Full Matrix of Pearson's Correlation Coefficients

The full matrix of Pearson's correlation coefficients includes the coefficients utilized in this study (high and medium significance) and the lesser and the not statistically significant correlation coefficients. Each cell contains the Pearson correlation coefficient, the sig-value, and N; statistically significant correlation coefficients are marked with an asterisk.

Table 20: Pearson's Correlation Coefficients r – Full Matrix

	AVG_ITOT	AVG_HSEV	starting.teacher. salary	salary.10year. teacher. w.master	PercentProficient. ELA.GR4	PercentProficient. ELA.GR7	PercentProficient. MATH.GR4	PercentProficient. MATH.GR7	PCTMAJ_MI N	PCTCOMP COLL	PCTNEW TEACHER	PCTSEPARATED TEACHERS	PCTFREEREDL	PCTCERT	PCTSUB
AVG_ITOT	1.000														
	794														
AVG_HSEV	0.289** 0.000 794	1.000													
	194														
starting.teacher.salary	0.314** 0.000 781	0.140** 0.000 781	1.000												
	787														
salary.10year.teacher.w.master	0.259** 0.000 731	0.300** 0.000 731	0.626** 0.000 734	1.000											
	734														
PercentProficient.ELA.GR4	0.202** 0.000 604	0.634** 0.000 604	0.133** 0.000 604	0.252** 0.000 554	1.000										
	605														
PercentProficient.ELA.GR7	0.067 0.275 264	0.636** 0.000 264	0.170 0.788 254	0.294** 0.000 223	0.645** 0.000 94	1.000									
	265														
PercentProficient.MATH.GR4	0.145** 0.000 604	0.673** 0.000 604	0.075 0.065 604	0.266** 0.000 554	0.859** 0.000 605	0.675** 0.000 94	1.000								
	605														
PercentProficient.MATH.GR7	0.102 0.098 264	0.758** 0.000 264	0.025 0.689 254	0.355** 0.000 223	0.582** 0.000 94	0.896** 0.000 265	0.728** 0.000 94	1.000							
	265														
PCTMAJ_MIN	-0.031 0.384 787	-0.361** 0.000 787	-0.009 0.804 780	-0.154** 0.000 728	-0.396** 0.000 602	-0.299** 0.000 259	-0.477** 0.000 602	-0.393** 0.000 259	1.000 791						
	791														
PCTCOMPCOLL	-0.102** 0.005 770	0.104** 0.004 770	-0.188** 0.000 763	-0.133** 0.003 712	0.065 0.117 589	0.151* 0.016 253	0.127** 0.002 589	0.198** 0.002 253	0.089* 0.013 773	1.000 773					
	773														
PCTNEWTEACHER	-0.363** 0.000 785	-0.073** 0.040 785	-0.139** 0.000 778	0.021 0.569 726	-0.132** 0.001 601	-0.037 0.558 258	-0.073 0.075 601	-0.004 0.953 258	0.292** 0.000 789	0.255** 0.000 773	1.000 789				
	789														
PCTSEPARATEDTEACHERS	-0.053 0.137 785	-0.266** 0.000 785	-0.034 0.343 778	-0.062 0.097 726	-0.208** 0.000 601	-0.210** 0.001 258	-0.233** 0.000 601	-0.277** 0.000 258	0.311** 0.000 789	-0.033 0.366 773	-0.019 0.601 789	1.000 789			
	789														
PCTFREEREDL	-0.048 0.181 769	-0.788** 0.000 769	-0.071** 0.049 761	-0.327** 0.000 715	-0.698** 0.000 592	-0.774** 0.000 250	-0.758** 0.000 592	-0.868** 0.000 250	0.418** 0.000 766	-0.121** 0.001 750	-0.066 0.001 764	0.264** 0.070 764	1.000 770		
	770														
PCTCERT	0.035 0.326 779	0.201** 0.000 779	0.033 0.359 771	0.012 0.746 720	0.183** 0.000 595	0.250** 0.000 257	0.216** 0.000 595	0.271** 0.000 257	0.034 0.347 782	0.068 0.058 766	0.060 0.092 781	-0.033 0.362 781	-0.185** 0.000 758	1.000 782	
	782														
PCTSUB	-0.292** 0.000 774	-0.272** 0.000 774	-0.225** 0.000 768	-0.029 0.434 719	-0.273** 0.000 591	-0.189** 0.003 252	-0.183** 0.000 591	-0.193** 0.002 252	0.150** 0.000 778	0.190** 0.000 762	0.579** 0.000 778	0.109** 0.002 778	0.156** 0.000 756	-0.263** 0.000 771	1.000 778

* indicating that the correlation coefficient is statistically significant at the 0.05 level (2 tailed).

** indicating that the correlation coefficient is statistically significant at the 0.01 level (2 tailed).

APPENDIX C: HUMAN INVESTIGATION COMMITTEE APPROVAL (COPY)



HUMAN INVESTIGATION COMMITTEE
 101 East Alexandrine Building
 Detroit, Michigan 48201
 Phone: (313) 577-1628
 FAX: (313) 993-7122
<http://hic.wayne.edu>



CONCURRENCE OF EXEMPTION

To: Christina Krispien
 College of Education

From: Ellen Barton, Ph.D. *E. Barton*
 Chairperson, Behavioral Institutional Review Board (B3)

Date: January 05, 2010

RE: HIC #: 119009B3X

Protocol Title: Distribution of Teacher Attributes Across Districts and Schools in the Detroit Metropolitan Area

Sponsor:

Protocol #: 0912007798

The above-referenced protocol has been reviewed and found to qualify for **Exemption** according to paragraph #4 of the Department of Health and Human Services Code of Federal Regulations [45 CFR 46.101(b)].

- Waiver of consent has been requested and approved.

This proposal has not been evaluated for scientific merit, except to weight the risk to the human subjects in relation to the potential benefits.

- Exempt protocols do not require annual review by the IRB.
- All changes or amendments to the above-referenced protocol require review and approval by the HIC **BEFORE** implementation.
- Adverse Reactions/Unexpected Events (AR/UE) must be submitted on the appropriate form within the timeframe specified in the HIC Policy (<http://www.hic.wayne.edu/hicpol.html>).

NOTE:

1. Forms should be downloaded from the HIC website at each use.
2. Submit a Closure Form to the HIC Office upon completion of the study.

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ABSTRACT**AN ANALYSIS OF TEACHER DISTRIBUTION ACROSS DISTRICTS AND
SCHOOLS IN THE DETROIT METROPOLITAN AREA**

by

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The demand that today's schools shall produce better educational outcomes of their pupils is stronger than ever before, especially in front of the background of our globalized, competitive world. Past and current research has supported the hypothesis that the teacher is the most important ingredient in the educational process. As the Detroit Metropolitan area, consisting of the three counties of Macomb, Oakland, and Wayne, provides a diversified picture of academic achievement and community background and a number of charter schools (public school academies), research regarding the distribution of teachers with certain desirable attributes across a student population distinguished by achievement, socioeconomic background, and community variables, was conducted.

The findings are not surprising, as the multiple statistic evaluations indicated an uneven distribution of more qualified teachers, favoring pupils in more affluent community settings and higher achieving pupils.

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Christina Susanne Krispien, born November, 2nd, 1962, in Hamburg, Germany.

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